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JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

VOLUME 41

1939

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
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Vol. 41. January, 1939. No. 481.

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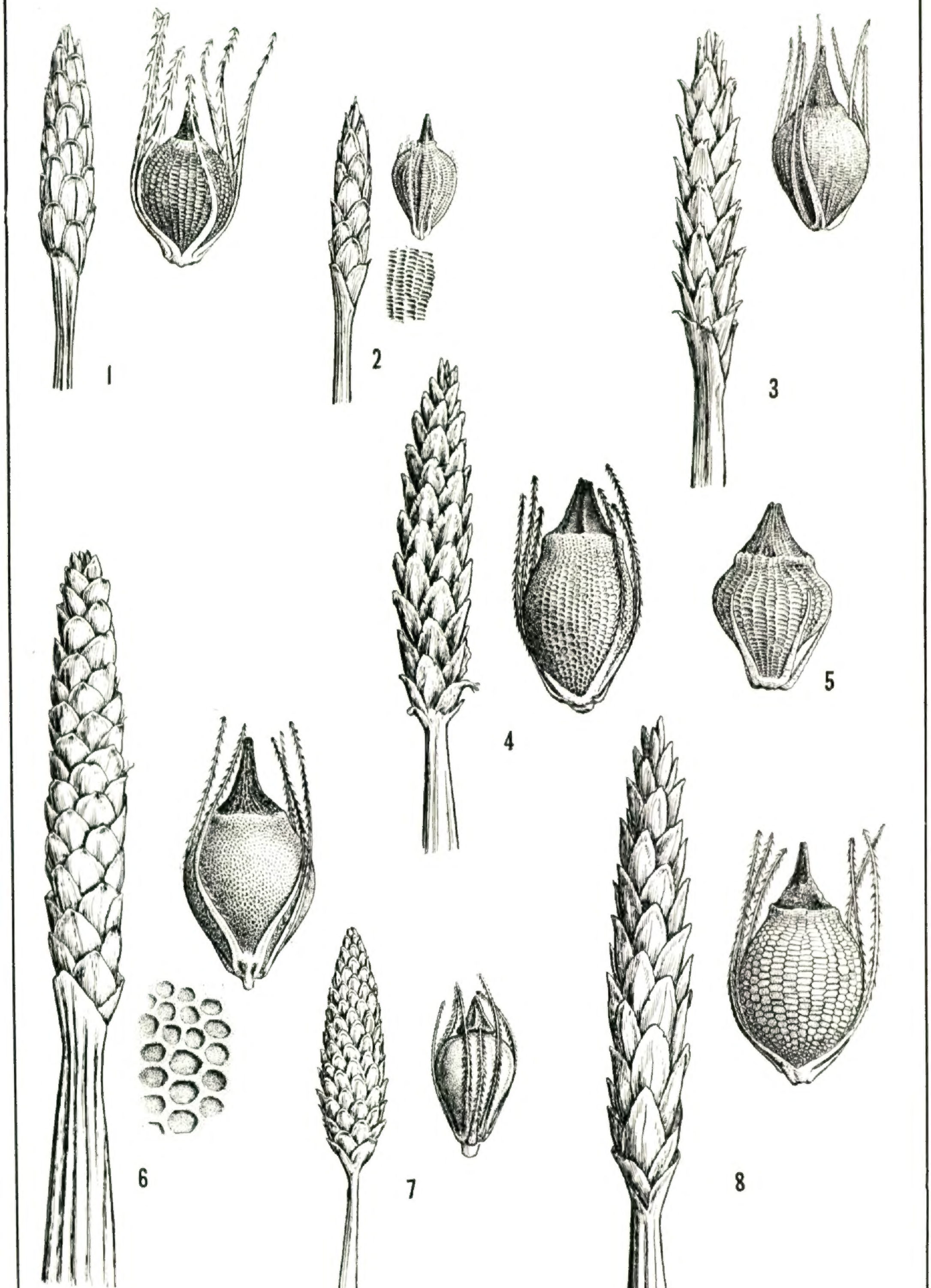

Eleocharis (spikelets × 2, achenes × 10). Fig. 1, E. plicarhachis. Fig. 2, E. elongata. Fig. 3, E. laxiflora. Fig. 4, E. variegata. Fig. 5, E. mitrata. Fig. 6, E. dulcis. Fig. 7, E. cylindrostachys. Fig. 8, E. calocarpa.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 41. January, 1939. No. 481.

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS—V[1]

H. K. Svenson

(Plates 537–547)

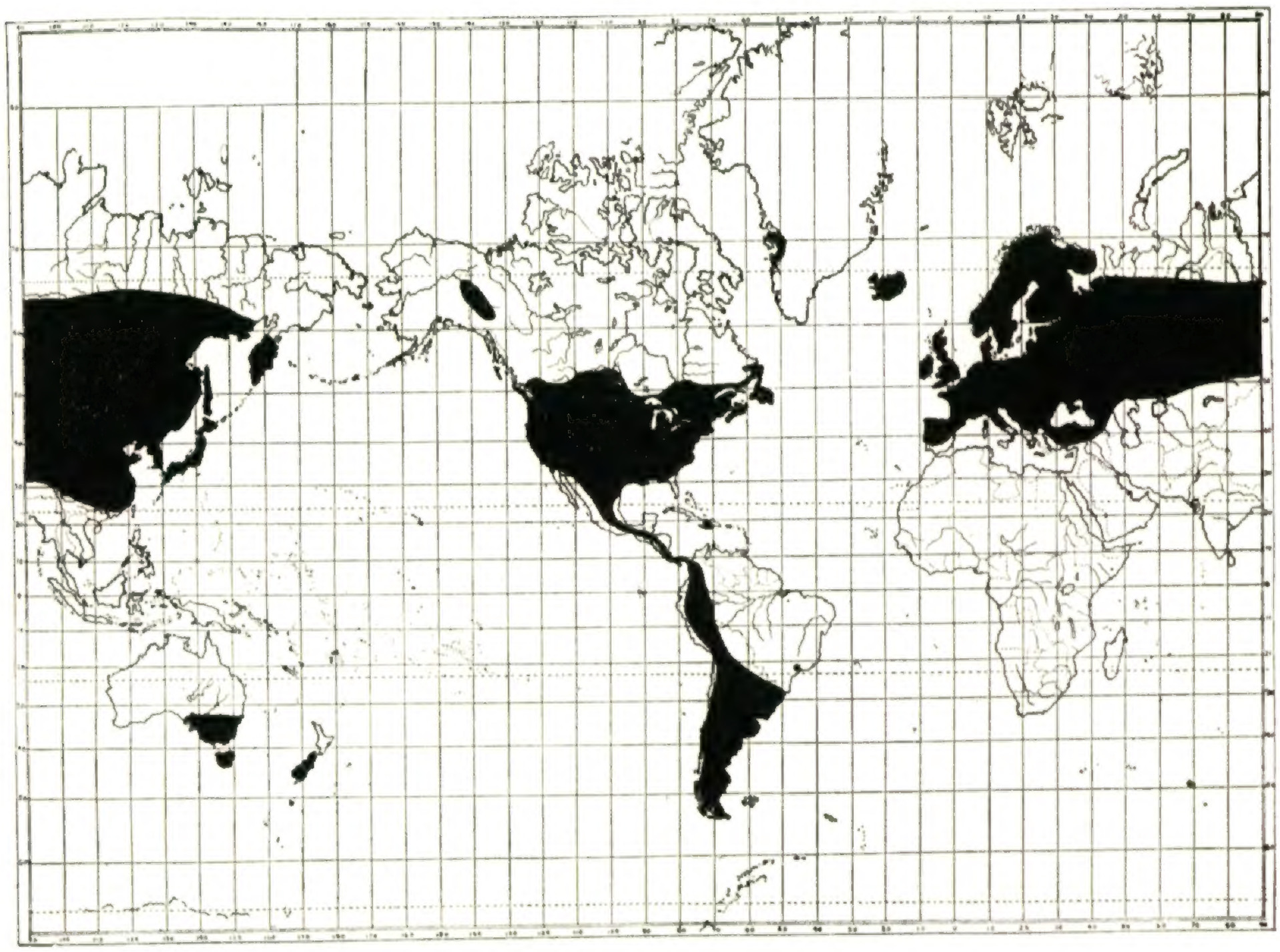
This paper, concluding the purely taxonomic treatment of *Eleocharis*, includes species not previously or adequately discussed, together with illustrations, distributional maps, and indexes to all species.

Since my initial treatment of the genus, I have seen most of the additional large collections of *Eleocharis* in this country, and during two visits to Europe, I was able to find many of the types which could not otherwise be interpreted. To all who have lent me material for study and to those who have given me access to collections, I offer my deep appreciation.

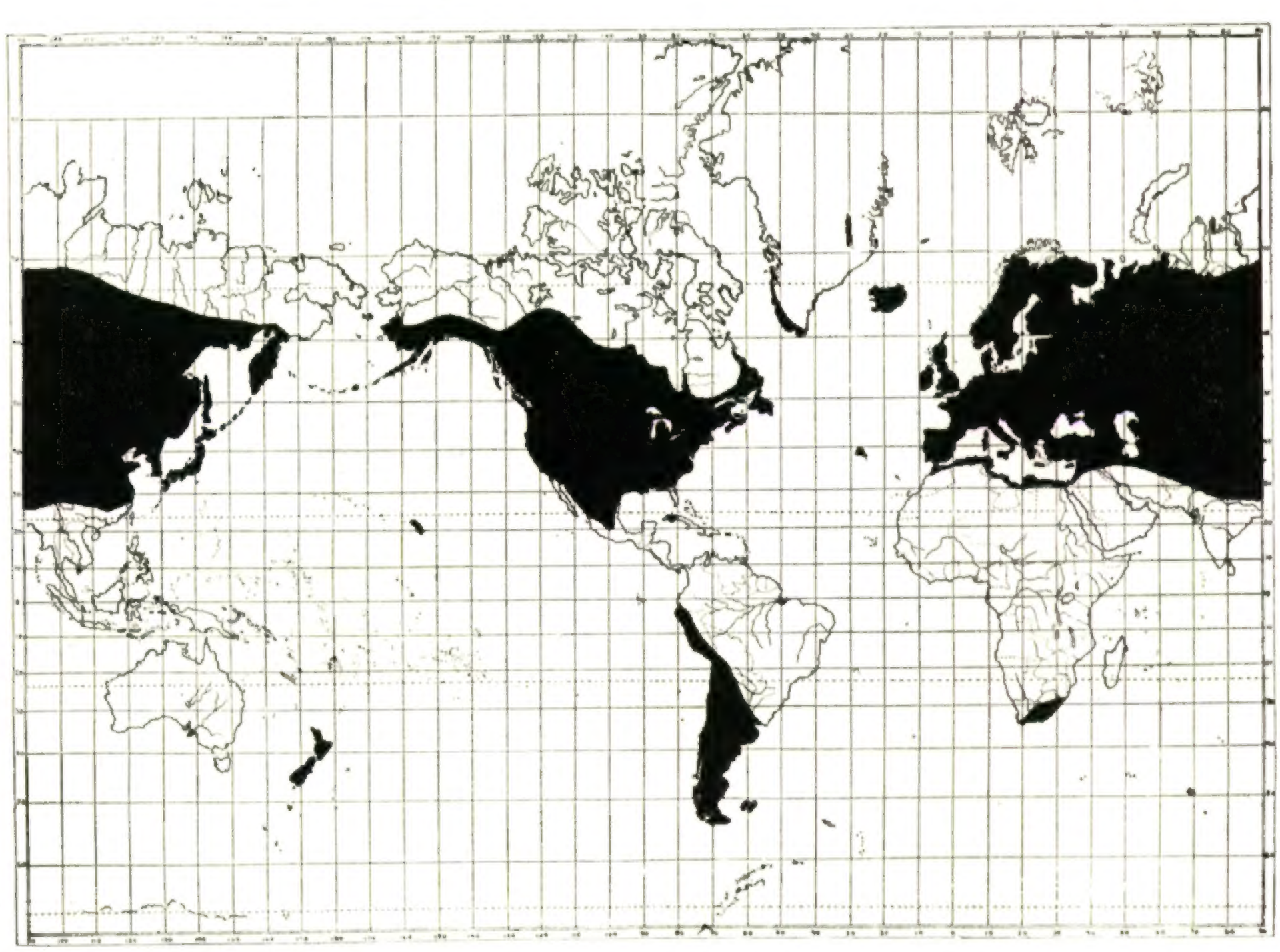
To the groups into which the genus has been divided (Rhodora xxxi. 127–129 (1929), the old-world *Multicaules* have been added; the incongruous series *Intermediae*, *Melanocarpeae* and *Tuberculosae* have been eliminated.

As to the relationships of *Eleocharis*, little can be said here. It is a "natural" genus, probably most closely allied to *Fimbristylis*, as Chermezon has pointed out. From species of *Scirpus* (i.e. *S. cespitosus*, *S. pumilus*, *S. planifolius*, etc.) there is a marked cleavage in the texture of the achene and especially in the type of cellular reticulation, the most important single character for determination of species in *Eleocharis*. As discussed under the *Palustres*, the relative width or constriction of the tubercle, the nature of the sheath-apex, or the

[1] Brooklyn Botanic Garden Contributions no. 85. The cost of plates and maps is met by the Brooklyn Botanic Garden.



MAP 1. Range of ELEOCHARIS, series ACICULARES.



MAP 2. Range of ELEOCHARIS, subseries PALUSTRES.

uniglumate condition of the lowest scale are not always dependable characters.

Eleocharis: Conspectus of the Genus

Series 1. Mutatae.

1, E. fistulosa. 2, E. nupeensis. 3, E. quadrangulata. 4, E. mutata. 5, E. cellulosa. 6, E. variegata. 7, E. laxiflora. 8, E. nuda. 9, E. calocarpa. 10, E. spiralis. 11, E. interstincta. 12, E. equisetoides. 13, E. dulcis. 14, E. sphacelata. 15, E. Robbinsii. 16, E. elongata. 17, E. mitrata. 18, E. Jelskiana. 19, E. plicarhachis.

Series 2. Pauciflorae.

20, E. pauciflora. 21, E. macrantha. 22, E. margaritacea. 23, E. parvula. 24, E. rostellata. 25, E. melanomphala.

Series 3. Aciculares.

26, E. exigua. 27, E. radicans. 28, E. bonariensis. 29, E. stenocarpa. 30, E. nervata. 31, E. brachycarpa. 32, E. cancellata. 33, E. bella. 34, E. Reverchonii. 35, E. Wolfii. 36, E. acicularis. 37, E. pusilla.

Series 4. Ovatae.

38, E. obtusa. 39, E. ovata. 40, E. Engelmanni. 41, E. lanceolata.

Series 5. Maculosae.

42, E. maculosa. 43, E. fuscopurpurea. 44, E. debilis. 45, E. bahamensis. 46, E. atropurpurea. 47, E. capillacea. 48, E. Sellowiana. 49, E. Schaffneri. 50, E. olivacea. 51, E. flavescens. 52, E. Sintenisii. 53, E. geniculata. 54, E. minuta. 55, E. intricata.

Series 6. Palustriformes.

Sub-series: Palustres.

56, E. palustris. 57, E. mamillata. 58, E. macrostachya. 59, E. neozeylandica. 60, E. melanostachys. 61, E. Dregeana. 62, E. mitracarpa. 63, E. Savatieri. 64, E. calva. 65, E. Smallii. 66, E. ambigens. 67, E. halophila. 68, E. uniglumis. 69, E. kamtschatica.

Sub-series: Truncatae (North American).

70, E. elliptica. 71, E. tenuis. 72, E. compressa. 73, E. nitida. 74, E. acutisquamata. 75, E. tricostata. 75a, E. cylindrica. 76, E. Bolanderi. 77, E. Palmeri. 78, E. decumbens. 79, E. Parishii. 80, E. intermedia. 81, E. Macounii.

Sub-series: Truncatae (chiefly South American).

82, E. Dombeyana. 83, E. crinalis. 84, E. Rabenii. 85, E. albibracteata. 86, E. montevidensis. 87, E. nodulosa. 88, E. Parodii. 89, E. elegans. 89a, E. densa. 90, E. Lechleri. 91, E. mendocina. 92, E. Spegazzinii. 93, E. Haumaniana.

Series 7. Tenuissimae.

94, E. minima. 95, E. urceolata. 96, E. Barrosii. 97, E. nana. 98, E. amazonica. 99, E. oligantha. 100, E. nigrescens. 101, E. subcancellata. 102, E. microcarpa. 103, E. retroflexa. 104, E. glauca. 105, E. alveolata. 106, E. Baldwinii. 107, E. vivipara. 108, E. subfoliata. 109, E. grisea. 110, E. minutissima. 111, E. tortilis. 112, E. tuberculosa. 113, E.

Chaetaria. 114, E. Brainii. 115, E. Schweinfurthiana. 116, E. caespitosissima. 117, E. anceps. 118, E. trilophus. 119, E. Naumanniana.

Series 8. SULCATAE.

120, E. nudipes. 121, E. pachystyla. 122, E. quinquangularis. 123, E. filiculmis. 124, E. glauco-virens. 125, E. Loefgreniana. 126, E. dunensis. 127, E. viridans. 128, E. pachycarpa.

Series 9. MULTICAULES. Old-world species, with 3-fid styles (except *E. carniolica*); usually with coarse culms. Spikelets frequently proliferous.

129, E. multicaulis. 130, E. marginulata. 131, E. limosa. 132, E. Baroni. 133, E. carniolica. 134, E. tetraquetra. 135, E. laeviseta. 136, E. pellucida. 137, E. congesta. 138, E. cylindrostachys. 139, E. acuta. 140, E. Dietrichiana. 141, E. Cunninghamii.

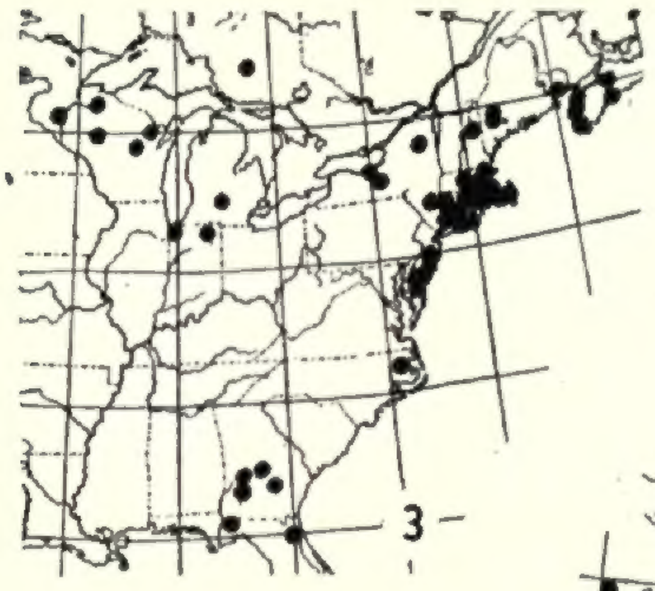
Species of uncertain classification.

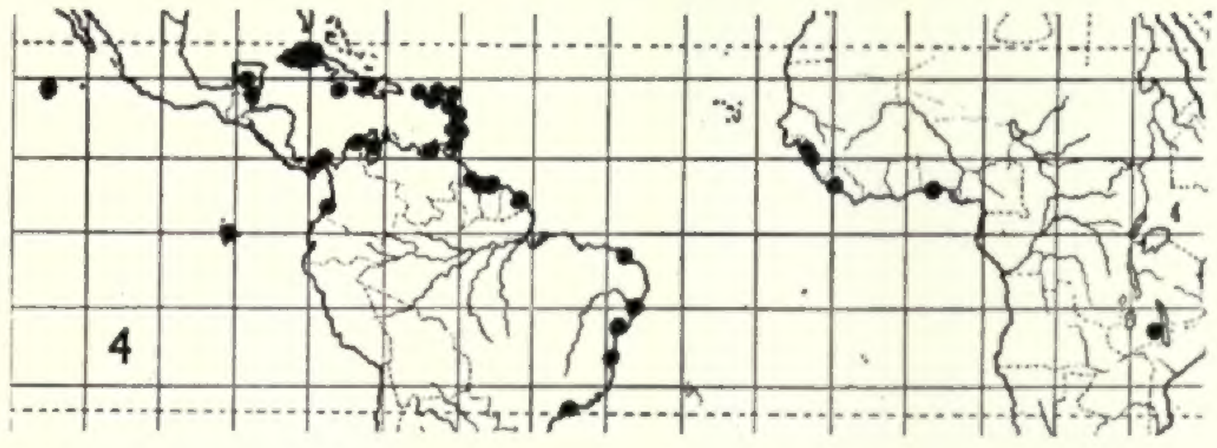
142, E. minarum. 143, E. melanocarpa. 144, E. albida. 145, E. squamigera. 146, E. subarticulata.

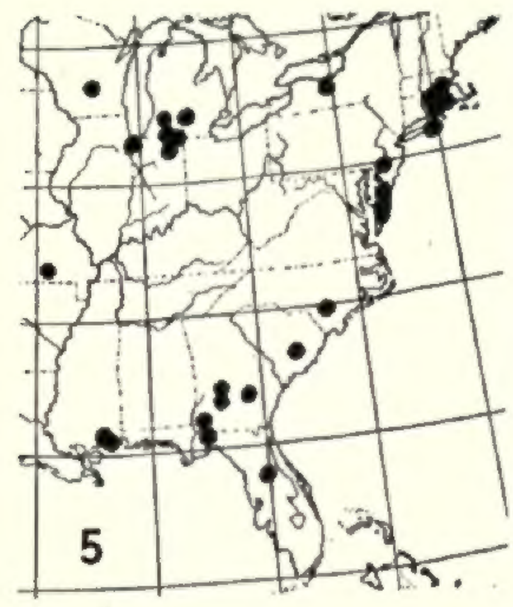
Series 1: MUTATAE

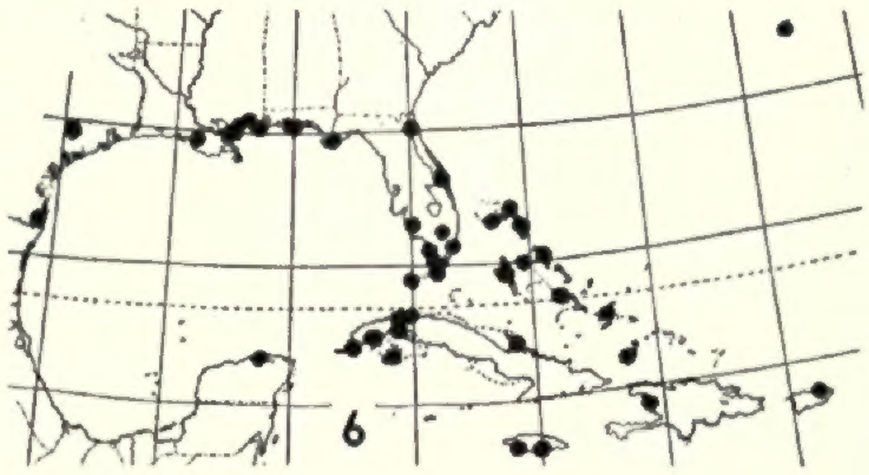
1. E. FISTULOSA (Poir.) Link [MAP 28]; Svenson, RHODORA xxxi. 152 (1929); Brain, Proc. Rhodesia Sci. Assoc. xxxiii. 84, pl. x, fig. 7 (1934); Hutchinson & Dalziel, Fl. West Trop. Afr. ii. 468 (1936). *Scirpus fistulosus* Poir. (1804), not Forskål (1775).[1] *S. angulatus* Willd. ex Kunth, Enum. ii. 155 (1837) (in synonymy). *E. planiculmis* Steud. Syn. Cyp. 80 (1855). Additional citations: CUBA: Hatuey, Santa Clara, *León* no. 9215 (NY). MEXICO: (sine loc.) *F. Mueller* no. 1367 (NY). GUATEMALA: Puerto Barrios, Dept. Izabal, *Standley* no. 25150 (NY). PANAMA: Chiriqui, El Bouquete, 1200 m., *Killip* no. 4569 (NY); Chepo, prov. Panama, *Pittier* no. 4557. COLOMBIA: Popayan, Dept. El Cauca, *Pennell* & *Killip* no. 8241. ECUADOR: San Cristobal, Galapagos Ids., *Schimpff* no. 113 (NY) (scales purplish). BOLIVIA: Apolo, 4800 ft. *R. S. Williams* no. 916 (NY); Sara, Dept. Santa Cruz, *Steinbach* no. 7444 (NY). PARAGUAY: Villa Rica, *Joergensen* no. 4497 (NY) and *Morong* nos. 298 (NY), 499 (NY). ARGENTINA: Misiones, *Ekman* no. 1295 (NY); Tucuman, *Venturi* no. 8485 (US, B). BRAZIL: Bahia, *Salzmann*, hb. Lindley (TYPE of *Limnochloa obtusetrigona*); Caldas, Minas Geraes, *Regnell II* no. 1309 (S); S. José, Matto Grosso, *Lindman* no. A2663 (S); Porto Alegro, Rio Grande do Sul, *Malme* no. 446 (S). AFRICA: TANGANYIKA: Manyoni Dist., 4200 ft., *Burtt* no. 3673 (K) (var. *robusta*) (culms bright yellow-green; scales brown-margined; basal sheaths dark reddish-brown; bristles short, smooth); Bukoba, 3700 ft., *Haarer* no. 2078 (K); Nyakato, Bukoba Dist., *Haarer* no. 2121 (K). ANGLO-EGYPTIAN SUDAN: Meshra el Rak, *N. D. Simpson* no. 7650 (K). BELGIAN CONGO: Kabinda, 6° S. 24° E., *Becquaert* no. 62 (G). SENEGAMBIA: Casamanca, *Chevalier* no. 2432 (K); nw. coast, *Hendelot* no. 320 (K). SIERRA

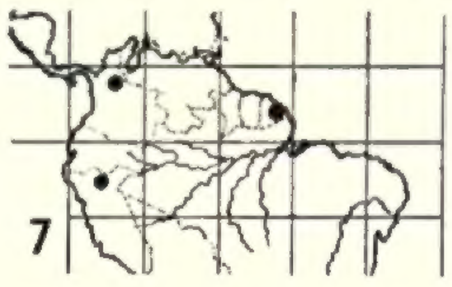
[1] The earlier homonym does not prevent the name *Scirpus fistulosus* Poir. from being used in Eleocharis [cf. *E. intermedia* (Muhl.) R. &. S. p. [56]].

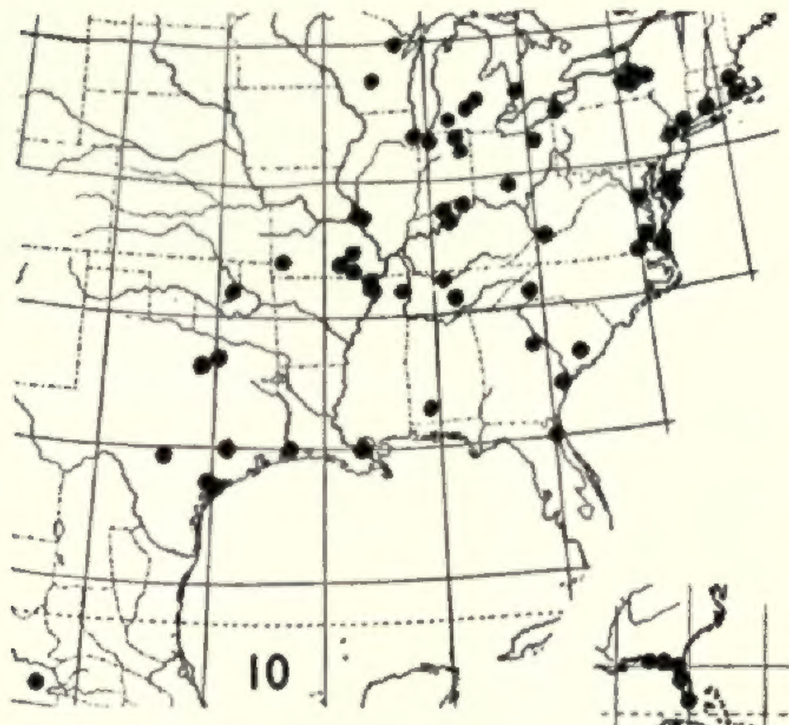


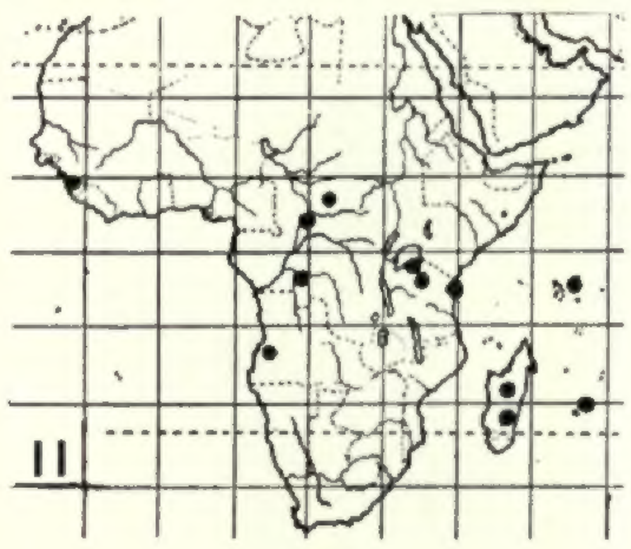


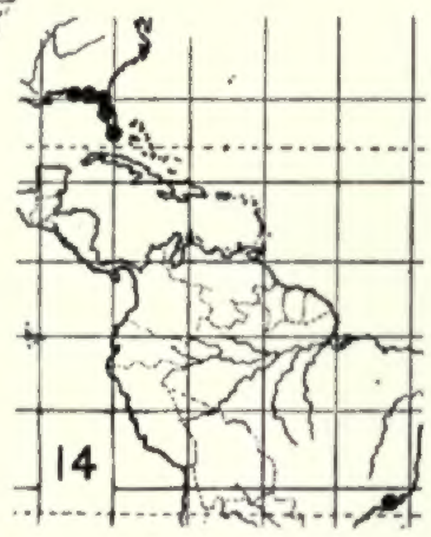


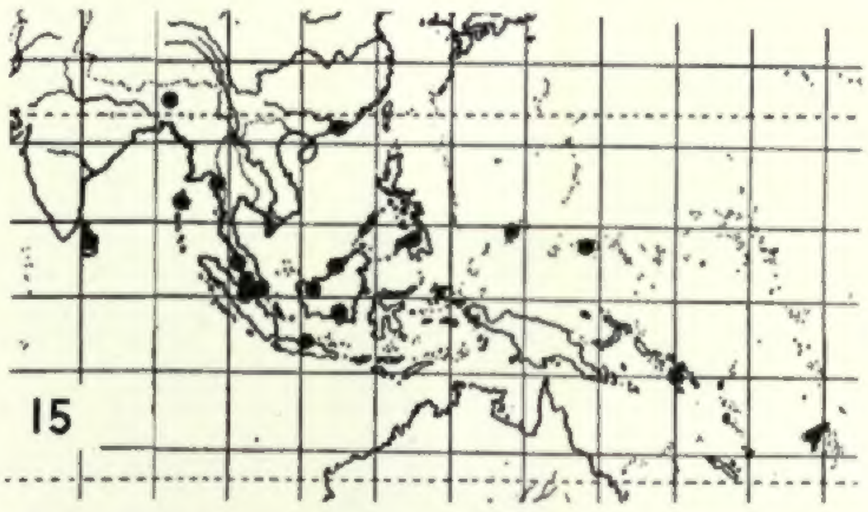


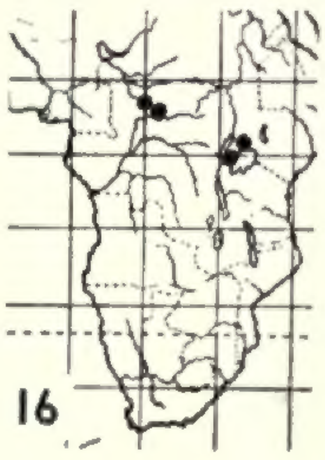


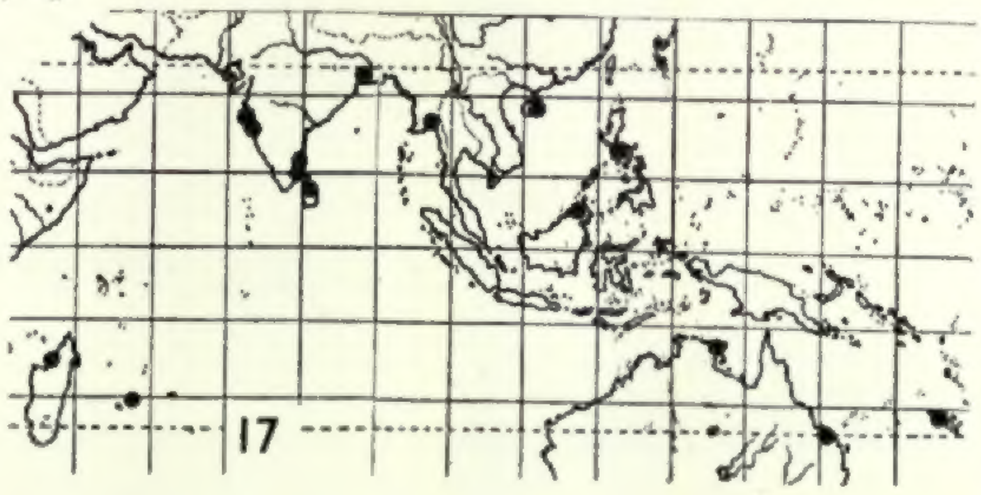












Maps 3–17. Map of Eleocharis, 3, Robbinsii; 4, mutata; 5, equisetoides; 6, cellulosa; 7, Jelskiana; 8, mitrata; 9, plicarhachis; 10, quadrangulata; 11, variegata; 12, nuda; 13, interstincta; 14, elongata; 15, laxiflora; 16, calocarpa; 17, spiralis.

LEONE: Erimakuna, *Elliott* no. 4453 (K); Romietta, *Thomas* no. 5605 (K); sine loc., *Dighton* no. 339 (K); *Thomas* no. 5296 (K). CAMEROON: Buar, 6° N. 15° E., alt. 900–1000 m., *Mildbraed*, no. 9402 (K). RHODESIA: Salisbury, 4800 ft., *Eyles* no. 4742 (K) (culms light green; scales colored). MADAGASCAR: *Perrier de la Bâthie* no. 17929 (B) (scales more obtuse than usual; achenes as in Clarke's illustration); Ankazobé, *P. de la Bâthie* no. 2722 (B) (scales purple-tinged); *Parker* in 1880 (K), in part; *Petit-Thouars* (Berlin, *Willd.* no. 1196). INDO-CHINA: Annam, Mt. Bani, *J. & M. S. Clemens* no. 4050 (NY) (as *E. variegata*). JAPAN: cf. Tokio Bot. Mag. xviii. 110 (1904). JAVA: *Zollinger* no. 284 (Paris, TYPE of *E. planiculmis*); *Blume* (NY). PHILIPPINE ISLANDS: Manila, *Merrill* no. 9790 (NY); Tanculan, Mindanao, *Bur.-Science* no. 26116 (NY). BORNEO: *Beccari* no. 853 (K). INDIA: Peninsula Ind. Or., hb. *Wight* nos. 1902 (NY), 3154 (NY), and *Wallich Cat.* no. 3453B (NY); Upper Gangetic Plain, *Thomson* (NY). EAST BENGAL: *Griffith* no. 6235 (NY). BRITISH NEW GUINEA: Dagwa, Oriomo River, Western Division, *Brass* no. 6010 (NY). AUSTRALIA: Cairns, Cook District, *S. T. Blake* no. 9371 (B); Mouton Bay, *Mueller* (Br. Mus.).

Though the achene-body in oriental specimens averages 1.5 mm. long, as in American material, *Wight* no. 3154 (NY) has the achene-body 2.0 mm. long, with linear surface-markings resembling those of *E. laxiflora*, exactly as in Clarke's illustration (t. xxxv, fig. 4). In the enormous Bolivian specimens of *Steinbach* no. 7444 the achene-body is also 2 mm. long. In *Harris* no. 8513 (Jamaica) the bristles are perfectly smooth.

2. E. NUPEENSIS Hutchinson & Dalziel, Fl. West Trop. Afr. ii. 467 (1936). Similar to *E. fistulosa*. I believe the following are synonyms: *E. fistulosa* var. *robusta* Boeckl. Flora lxii. 563 (1876); Svenson, RHODORA xxxi. 153, pl. 188, fig. 13 (1929). *E. mitrata* var. *africana* C. B. Clarke in Thistleton-Dyer, Fl. Trop. Afr. viii. 406 (1902) and Durand & Schinz, Consp. Fl. Afr. v. 599 (1895) (nomen). *E. fistulosa* var. *micrantha* Chermezon, Archiv. Bot. Caen. vii. Mém. no. 4: 25 (1936).—The TYPE (*Barter* no. 1040 (K) from Nupe, northern Nigeria), has grayish achenes 2 mm. long, with brown-rimmed horizontal cells, and spikelets much more slender than in *E. fistulosa*. Judging from description, *E. fistulosa* var. *micrantha* (from Pont du Gendarme near Saint Louis, Senegal), is the same as *E. nupeensis*.

E. nupeensis, *E. fistulosa*, *E. mutata*, *E. variegata*, and *E. calocarpa* show great complexity in tropical Africa, and distinction between species is not yet wholly satisfactory.

3. E. QUADRANGULATA (Michx.) R. & S. [MAP 10]; Svenson, RHODORA xxxi. 132 (1929).—Noteworthy range extensions: NEW YORK: Panther Lake, Oswego Co., *House* no. 20112 (Alb); Long Pond, North Salem,

Westchester Co., *Dr. Meade* (Alb); Lake Mahtowantah, Fulton, Oswego Co., *Coville* no. 16 (Alb). WEST VIRGINIA: Shawnee Lake, Mercer Co., *Core* in 1929 (W Va, Duke). NORTH CAROLINA: Hendersonville, *Blomquist* no. 5572 (Duke). GEORGIA: Augusta, *Hildebrand* in 1923 (Duke). INDIANA: Lake Everett, Allen Co., *Deam* no. 20819 (D); Fredonia, Crawford Co., *Deam* no. 27306 (D); Corydon, Harrison Co., *Deam* no. 20517 (D); Bass Lake, Starke Co., *Deam* no. 54251 (D, B); Adams Lake, Lagrange Co., *Deam* nos. 54104 (D, B), 55356 (D, B); Madison, Jefferson Co., *E. Banta* in 1934 (D, B). LOUISIANA: marsh near Orange, Texas, *Munz* no. 1456 (Pomona). ILLINOIS: St. Clair Co., *Brendel* (Ill); Wolf Lake, *E. J. Hill* no. 90 (Ill); Mascoutah, *Welch* in 1862–1870 (Ill). WISCONSIN: Crooked Lake, Oxford, Adams Co., *Fassett & Hotchkiss* no. 14396 (B); Shewano Lake, Shewano Co., *Hotchkiss & Kochler* no. 4311 (B). MEXICO: Atequiza, Jalisco, *Pringle* no. 3473 (B) (scales strongly purple-margined).

Professor Fernald (RHODORA xxxvii. 393 (1935)) has distinguished the coarser plants characteristic of the northern range as var. *crassior*. Having collected the smaller variety in shallow ponds choked by other aquatic vegetation and the larger form in open deep ponds northward, I suspect that opportunity for growth with little competition is an important factor in determining size.

4. E. MUTATA (L.) R. & S. [MAP 4], Svenson, RHODORA xxxi. 133 (1929); Hutchinson & Dalziel, Fl. West Trop. Afr. ii. 467 (1936). MEXICO: Lake Chichencanab, Quintana Roo, *Swallen* no. 2769 (US). REVILLAGIGEDO IDS.: Clarion I., *Howell* 8357 (Cal). BRITISH HONDURAS: Sibun R., *Gentle* nos. 1429, 1432 (Cath. Univ.). ECUADOR: Puna Island, *Andersson* in 1852 (S, as *E. scariosa*). BRAZIL: Sebastianopolis, *Martius* no. 229 (NY); Ceará, *Drouet* no. 2503 (B); Rio de Janeiro, *Glaziou* no. 9337 (NY). AFRICA: LIBERIA: Monrovia, *Massey* no. 82 (NY). SIERRA LEONE: Mambolo, *Deighton* no. 978 (K); Bagroo River, *Mann* no. 93 (K); frequent in patches in tidal swamps, withstands considerable brackishness, *Glanville* no. 211 (K). NIGERIA: salt water swamp, Lagos Island, *Barter* no. 2234 (K); Lagos, *MacGregor* no. 327 (K). BRITISH EAST AFRICA: Pemba, *Greenway* no. 2730 (K).

5. E. CELLULOSA Torr. [MAP 6]; Svenson, RHODORA xxxi. 152 (1929).

Occasional specimens with angled culms appear very close to *E. mutata*. A few specimens have bristles with traces of teeth; in *Britton, Britton & Brown* no. 6636 from Condado, Porto Rico, the bristles are strongly barbed. The glossy achene of *E. cellulosa* has much larger surface cells than the rough dull achene of *E. mutata*, and the scales are frequently reddish. With a single exception (*C. Wright*, Rutersville, Texas), all specimens are from brackish coastal areas.

6. E. VARIEGATA (Poir.) Presl [PL. 537, FIG. 4; MAP 11]. Culms stout (3 mm. wide), cylindric, often twisted, and sometimes trigonous below the inflorescence; spikelets lanceolate-cylindric, 1.5–2.5 cm. long, 3–4 mm. wide; scales *not appressed*, ovate, blunt, striate, convex, semi-glutinous, *yellow with ferruginous margins, the lacerate apex broadly hyaline;* stamens 3; style 3-fid (or 2-fid); achene obovate, biconvex, 2.0–2.5 mm. long, stramineous, with about 15 rows of inflated horizontally-elongated to isodiametric cells; style-base dark brown, flattened, 0.5 mm. long; bristles brown, equalling or exceeding the achene or frequently wanting.—Svenson, RHODORA xxxi. 156 (1929); Brain, Proc. Rhodesia Sci. Assoc. xxxiii. 84, pl. x, fig. 10 (1934); Chermezon, Arch. Bot. Caen iv, no. 7:40 (1931); Hutchinson & Dalziel, Fl. Trop. West Afr. ii. 84 (1936).—MADAGASCAR: massif de l'Andringitra, 2000 m., *Perrier de la Bâthie* no. 14567 (B); *Blackburn* (K); *Petit-Thouars* (Berlin, hb. Willd.). MAURITIUS: *Sieber* no. 19 (NY); *R. E. Vaughan* no. B2 (K). SEYCHELLES: Maké, *Thomasset* (K) (differs from *Sieber* no. 19 in heavier, longer bristles and closer reticulation of achene). BELGIAN CONGO: Wombali, *Vanderyst* nos. 4263, 4243 (K) (similar to Madagascar plant but lacks bristles). TANGANYIKA: Arusha, 4000 ft., *Haarer* no. 972 (K) (achene identical with *Sieber* no. 19; culms sharply 3-angled at apex); papyrus swamp, Kiagwe, Lake Victoria, 3700 ft., *Eggeling* no. 502 (K); Pemba, *Vaughan* no. 681 (K). ANGOLA: Benguella, country of the Ganguellas, *Grosweiler* no. 2767 (K) (culms shining; scales light brown to rose-color, with green center; no bristles). SIERRA LEONE: Mowoto, *Deighton* no. 1687 (K) (specimen young and questionable).

7. E. LAXIFLORA (Thwaites) H. Pfeiffer [PL. 537, FIG. 3; MAP 15], Mitt. Inst. Bot. Hamburg vii. 169 (1928). *E. variegata* var. *laxiflora* (Thwaites) C. B. Clarke; Svenson, RHODORA xxxi. 156 (1929). (?) *E. Graeffiana* Boeckl. Flora lviii. 108 (1875). –INDIA: Silhet, *Hooker & Thomson* (K); Tenasserim & Andamans, hb. *Helfer* no. 6220/1 (K); Malay Peninsula, *Griffith* no. 6229 (K); Singapore, *Hullett* in 1893 (K); *Ridley* no. 5799 (K); *Penang Botanic Gardens* no. 4543 (K); Malacca, *Lemann* in 1845 (K); Ceylon, hb. *Macrae* (K). JAVA: *Zollinger* nos. 266 (K), 291 (Paris, TYPE of *E. ochrostachys* Steud.). BORNEO: Banjarmasing, *Motley* no. 1266 (K); Sarawak, *Beccari* nos. 6 (K) & 3720 (K); *J. & S. Clemens* no. 20825 (NY); Kuching, *Ridley* no. 12347 (K). PHILIPPINE ISLANDS: Tanculan, Mindanao, *Bureau of Science* no. 26129 (NY). SUMATRA: Bila, *Toroes* no. 3027 (NY). FIJI ISLANDS: *Capt. Wilkes* (K) (as *E. Graeffeana*). CAROLINE ISLANDS: Ponape, *Kanehira* nos. 679 (NY), and 1515 (NY); *Ledermann* no. 13657 (K); Yap, *Kanehira* no. 1152 (NY). SOLOMON ISLANDS: chiefly New Georgia, *H. M. S. "Penguin,"* 1894–5 (K). The type of *E. Graeffeana* came from Opolu, Samoa.

8. E. NUDA C. B. Clarke [PL. 538, FIG. 4; MAP 12], Kew Bull. Add. Ser. viii. 21 (1908) and Ill. Cyp. t. xxxv. figs. 8–11 (1909). *E. philippinensis* Svenson, RHODORA xxxi. 155 (1929).—CHINA: Hainan, hb.

Canton Christian College no. 7793 (NY). AUSTRALIA: Buderim, Moreton Dist., Queensland, *S. T. Blake* no. 5227 (B); Cairns, Cook Dist., Queensland, *Blake* nos. 9360 (B) & 9361 (B); Virginia, Brisbane, *Blake* no. 1421 (B); between Norman and Gilbert River, *Gulliver* (K, TYPE).

In this species, as in most others of *Eleocharis*, presence or absence of bristles and direction of teeth are of little importance.

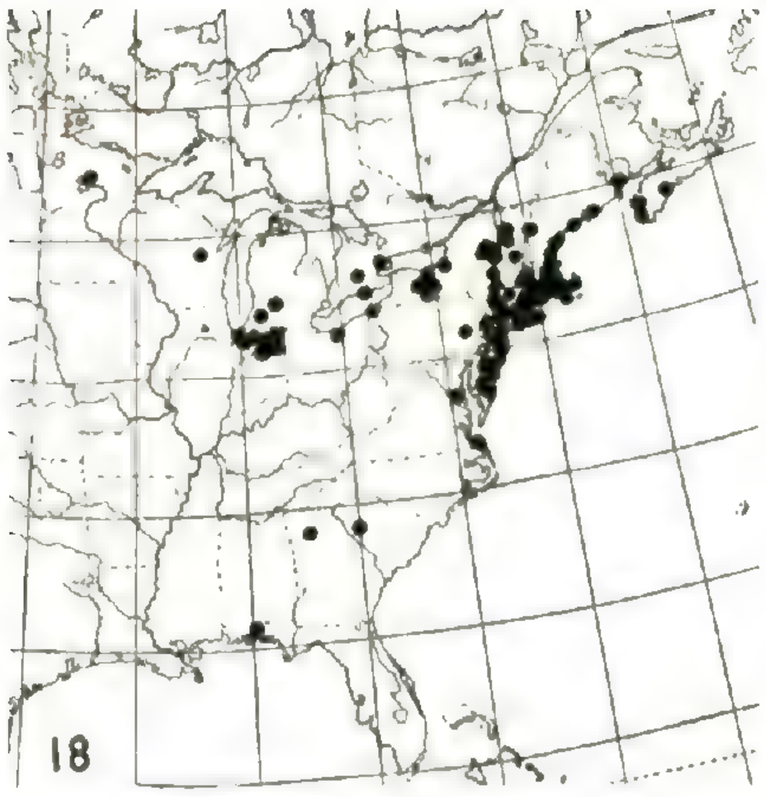
9. E. CALOCARPA Chermezon [PL. 537, FIG. 8; MAP 16]. Perennial, culms 3.5–7.5 dm. high, 2–2.5 mm. wide, rigid, quadrangular: spikelets cylindric, subacute, 20–35 cm. long, 3.5 mm. wide: scales lax, 4 mm. long, ovate-lanceolate, obtuse, stramineous-fuscous, sometimes with a reddish margin, striate, convex: stamens 3: style 3-fid: achene biconvex, obovoid, 2 mm. long, orange, with about 12 rows of horizontally-elongated, strongly inflated cells: style-base dark brown, conic, flattened, 0.5 mm. long; bristles light brown, surpassing the achene.—Arch. de Bot. Caen iv. no. 7: 41 (1931). AFRICA: Mangapou [6° N. 23° E.], Haut Oubangui, *Le Testu* no. 3162; King's Lake, Kampala, Uganda, 3900 ft., *Hancock & Chandler* no. 21 (K, B) (det. Chermezon).

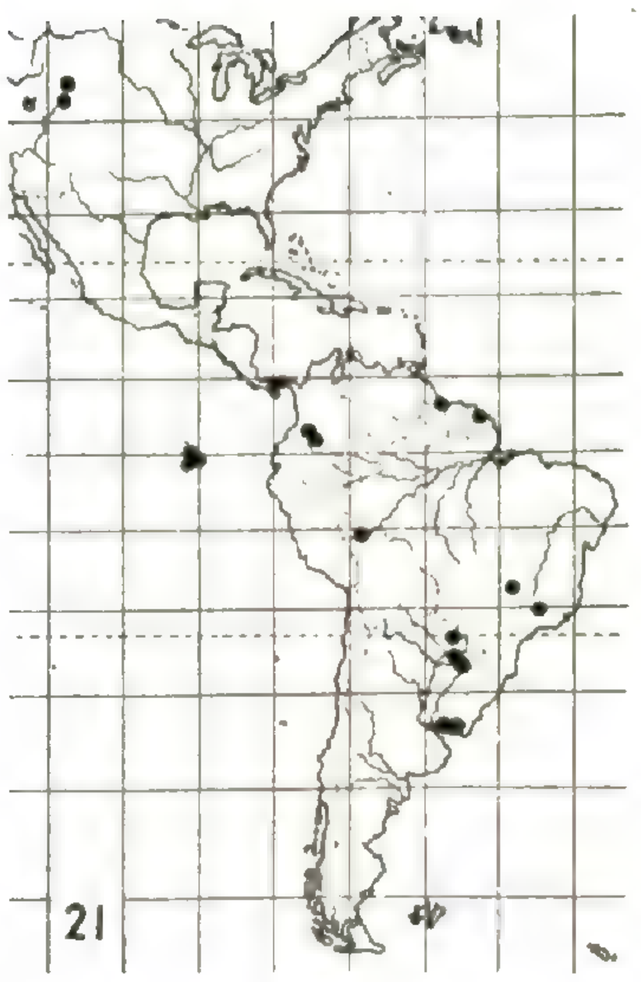
var. NUDA Chermezon (l. c.). Differs from the type in lack of bristles, and smaller (1.5 mm. long), pale yellow achenes.—Moroubas, Haut Oubangui, *Tisserant* no. 1186; Masaka District, 3800 ft., Uganda, *Chandler* no. 1393 (K, B) (culms terete).

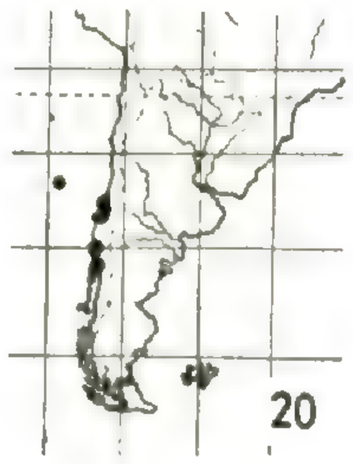
E. calocarpa and *E. variegata* appear to be very closely related. The achenes have the same type of inflated surface cells, approached nowhere else in the genus except in the Caribbean *E. cellulosa*. Except for color of achenes, the chief distinction seems to lie in the 4-angled culms of *E. calocarpa* as compared with the cylindric culms of *E. variegata*. Similar cylindric culms are characteristic of *E. cellulosa*, but sharply-angled culms are occasional. The absolute specific value of the angled culm is therefore open to question.

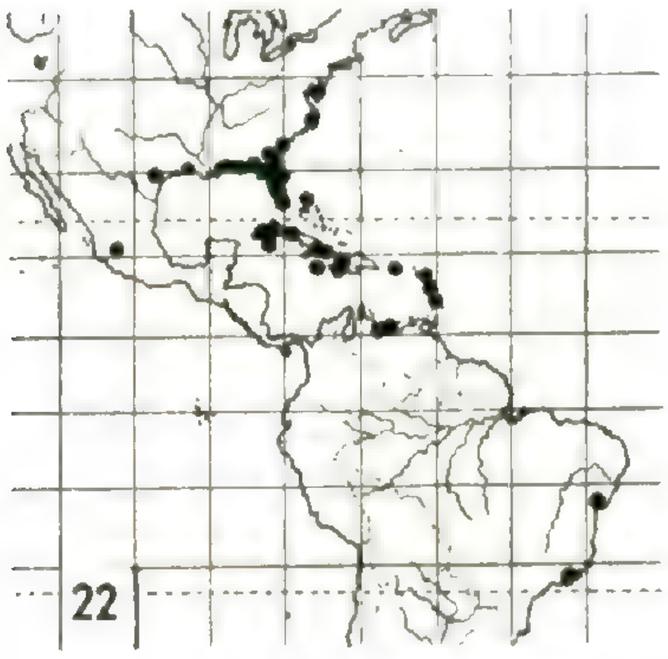
10. E. SPIRALIS (Rottb.) R. & S. [MAP 17]; Svenson, RHODORA XXXI. 135 (1929). *E. compacta* R. Br. Prod. 224 (1810). *Scirpus compactus* Poir. Encyc. Suppl. v. 102 (1817); Spreng. Syst. 1. 203 (1825). *E. austro-caledonica* Vieillard, Ann. Sci. Nat. Bot. ser. 4, XVI. 38 (1862).—Mauritius, Madagascar and the Orient. MAURITIUS: *Bouton* no. 3 (K). MADAGASCAR: marais saumâtres, baie de Bombetoka,[1] *Perrier de la Bâthie* no. 2498 (B). CHINA: in water near the sea, Hainan, *Liang* no. 66592 (NY). INDIA: East Bengal, *Griffith* no. 6231 (K); in subsalsis uliginosis insulae Salsette, *Jacquemont* no. 446 (K); Burma, *Griffith* (K); Bengal, *Lehmann* in 1845 (K); Bombay, *Lisboa* (?) (K); Tranquebar, *Rottler* in 1798 (K); Pondicherry, *Meebold* no.

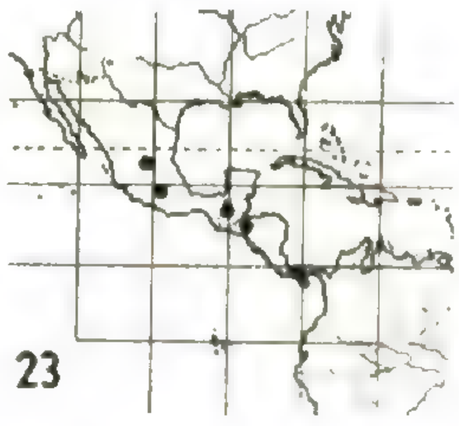
[1] Professor Chermezon has informed me that this is the only station known in Madagascar and that the plant is perhaps an introduction.

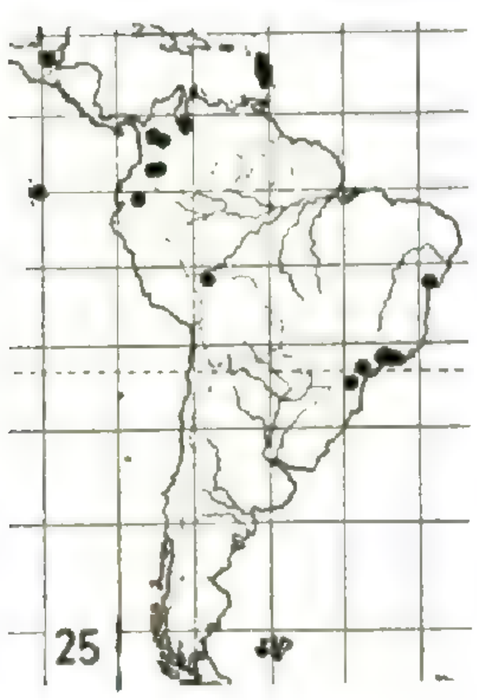


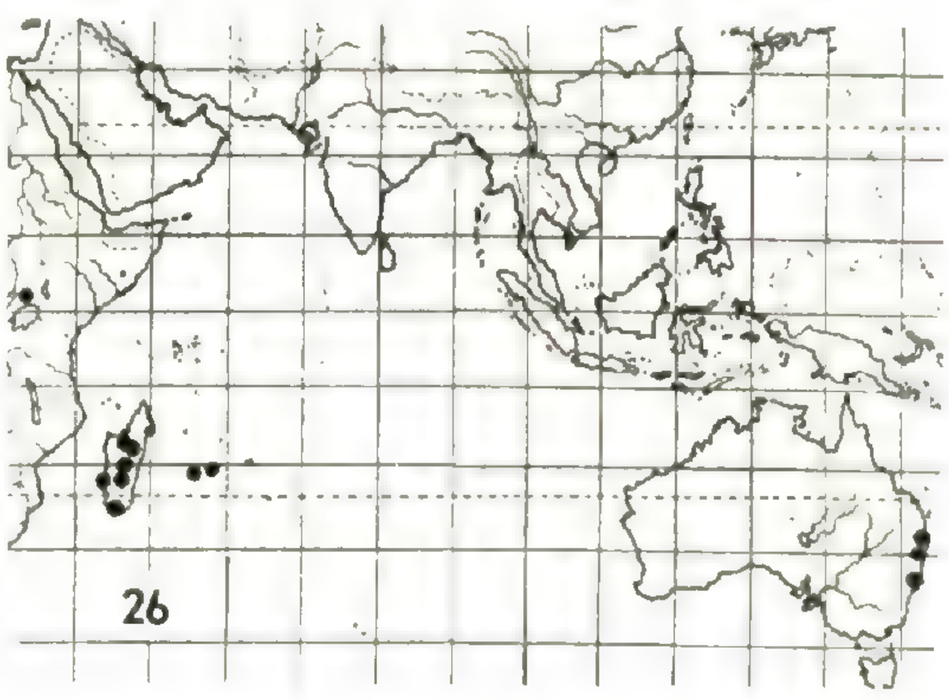


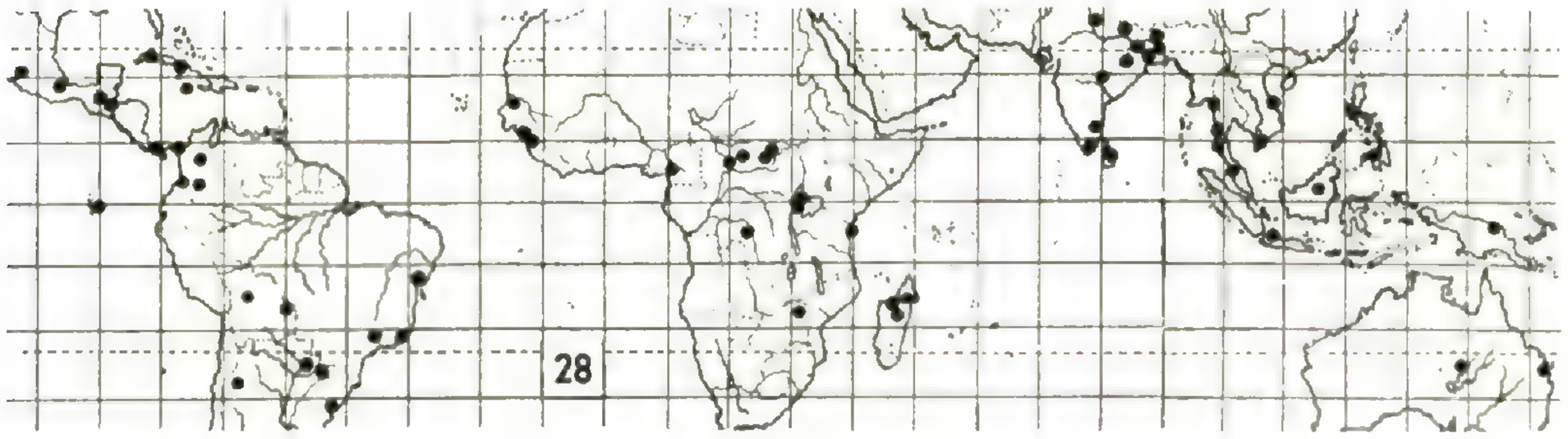












MAPS 18–28. Map of ELEOCHARIS, 18, OLIVACEA; 19, CAPILLACEA; 20, FUSCO-PURPUREA; 21, SELLOWIANA; 22, FLAVESCENS; 23, SCHAFFNERI; 24, SINTENISII; 25, MACULOSA; 26, MINUTA; 27, INTRICATA; 28, FISTULOSA.

2539 (K); CEYLON: *Thwaites* (K). PHILIPPINE IDS.: Manila, *Merrill* no. 9788 (NY). NEW CALEDONIA: *Paucher* (K); eaux sumâtres, *Vieillard* no. 1453 (K, COTYPE of *E. austro-caledonica*). AUSTRALIA: Arnhem, South Bay, *R. Brown* (K); north coast, *R. Brown* no. 5934 (Br. Mus., TYPE of *E. compacta*); Gladstone, Queensland, *S. T. Blake* no. 12790 (B). The species is also represented in the Willdenow Herbarium, no. 1195, fol. 1, *Roestal* (without locality).

11. E. INTERSTINCTA (Vahl) R. & S. [MAP 13]; Svenson, RHODORA xxxi. 130 (1929). *Limnochloa obsoleta* Nees in Martius, Fl. Bras. ii[1]. 100 (1842). *E. obsoleta* Steud. Syn. Cyp. 81 (1855). *E. cognata* Steud. Syn. Cyp. 81 (1855) [Guiana], e. desc. Additional noteworthy citations: FLORIDA: La Belle, Hendry Co., *F. M. Uhler* & *C. F. Smith* in 1937 (B). TEXAS: Neuces River, Uvalde Co., *E. J. Palmer* no. 14518 (B). BOLIVIA: 500 m., Buena Vista, Santa Cruz, *Steinbach* no. 5216 (G).

12. E. EQUISETOIDES (Ell.) Torr. [MAP 5]; Svenson, RHODORA xxxi. 131 (1929). Additional citations: NEW YORK: Mendon Pond, Monroe Co., *Mathews* in 1920 (Alb). DELAWARE: near Lewiston, *Nuttall* (NY). MICHIGAN: White Lake, Kalamazoo Co., *Hanes* no. 1377 (B); Sand Lake, Jackson Co., *J. Wright* (NY); Portage Lake, Jackson Co., hb. *S. H. Camp* no. 11434 (NY). INDIANA: Hunter Lake, Elkhart Co., *Deam* no. 52342 (B); North Twin Lake, Lagrange Co., *Deam* no. 52436 (B). WISCONSIN: Madison (coll. unknown) (G). MISSISSIPPI: Woolmarket, *Tracy* no. 3224 (NY); Ocean Springs, *Tracy* no. 91 (NY).

13. E. DULCIS (Burm. f.) Trinius [PL. 537, FIG. 6]; Svenson, RHODORA xxxi. 158 (1929). *E. equisetina* Presl; Svenson, RHODORA xxxi. 161 (1929). *E. plantaginoides* (Retz.) Domin, Bibl. Bot. xx. 445 (1915).

This widespread, cultivated oriental species, the Chinese water-chestnut, has appeared in West Africa (cf. Hutchinson & Dalziel, l. c., as *E. plantaginea*). Photographs of Presl's type of *E. equisetina*, which Dr. Malkovsky has most kindly sent me from the National Museum of Praha, show that it is a slender phase of *E. dulcis*. A specimen from the vicinity of Daru Island, British New Guinea, *Brass* no. 6064 (NY) has the robust character of *E. sphacelata*, associated with achenes typical of *E. dulcis*. Possibly it represents a transition between the two species.

14. E. SPHACELATA R. Br.; Svenson, RHODORA xxxi. 160 (1929).

15. E. ROBBINSII Oakes [MAP 3]; Svenson, RHODORA xxxi. 154 (1929).

Specimens possibly from the TYPE collection, labelled "White Mts. of N. Hampshire, cl. Oakes legit" are at the Brooklyn Botanic Garden, originating from the herbarium of C. F. Austin. The northernmost collection of *E. Robbinsii* seems to be W. R. Watson's no. 442 (Can) from the Timagami Forest Reserve, Ontario.

MUTATAE: KEY TO THE SLENDER SOUTH AMERICAN SPECIES

Achenes trigonous; 1–1.5 mm. long (including style-base) . . . . . *E. elongata.*
Achenes biconvex; 2–4 mm. long (including style-base)
  Achene constricted into a neck below style-base
    Style-base trilobed . . . . . *E. mitrata.*
    Style-base not trilobed . . . . . *E. Jelskiana.*
  Achene not constricted . . . . . *E. plicarhachis.*

16. E. ELONGATA Chapman [PL. 537, FIG. 2; MAP 14]; Svenson, RHODORA xxxi. 155 (1929).—*E. elongata* has the smallest achenes in the group, the body being only 1.0–1.2 mm. long. Further citations: FLORIDA: Appalachicola, *Chapman* (NY). ALABAMA: Point Clear, *Mohr* in 1866 (NY). Here belong also two specimens from BRAZIL: Rio de Janeiro, *Glaziou* nos. 9338 & 6430 (K), as *E. clata.*

On No. 9338 Clarke has commented "a startling plant to me. The nut nearly as that of *acicularis.*"

Also at Kew there is a collection from Sao Paulo (*Usteri* no. 24c) labeled as *E. clata.* It resembles *E. Robbinsii,* but has almost cylindric culms and spreading scales. The achene-body is 3 mm. long with about 20 rows of indistinct markings on each face (much as in *E. elongata*), constricted above as in *E. Sagotii,* with a dark brown style-base 1 mm. long, and bristles exceeding the achene. Judging from description, it is probably E. BRASILIENSIS Boeckl. (cf. Svenson, RHODORA xxxi. 162 (1929)).

17. E. MITRATA (Griseb.) C. B. Clarke [PL. 537, FIG. 5; MAP 8]. *Scirpus mitratus* Grisebach, Fl. Br. W. I. 570 (1864).—TRINIDAD: Savana Tiareo, July 2, 1848, *Crueger* (COTYPE, K). SAN DOMINGO: Sabana de la Mar, Cordillera Central, *Ekman* no. 15611 (S). FRENCH GUIANA: Cayenne, *Jelski* (Berlin, in part). BRAZIL: vic. Barra [Manaos], prov. Rio Negro, Dec.–Mar. 1850–51, *Spruce* (K); Campo de Jauauarí, Jan. 1851, *Spruce* no. 1289 (K).

E. mitrata, close to *E. plicarhachis* in appearance, has larger spikelets with obtuse thickened scales, and achenes 2.0 mm. long, including the blunt, usually tricuspidate, style-base which is 0.5 mm. long.

18. E. JELSKIANA Boeckl. Linnaea xxxviii. 376 (1874) [MAP 7]. *E. Sagotii* C. B. Clarke, Kew Bull. Add. Ser. viii. 20 (1908); Uittien in Pulle, Fl. Surinam i. 111 (1934).—FRENCH GUIANA: Cayenne, *Jelski* (Berlin, COTYPE of *E. Jelskiana*); Cayenne, *Sagot* no. 1390 (K, TYPE of *E. Sagotii*). COLOMBIA: Polonia, Santander, 100 m., *Killip & Smith* no. 14914 (NY). PERU: Tarapoto, *Spruce* no. 4284 (K, TYPE of *E. Peruviana*[1]) and no. 4282 (K, NY).

The collection of *E. Jelskiana* at Berlin is mixed with *E. mitrata,* but from Boeckeler's description, the elements are separable. *E.*

[1] Kew Bull. Add. Ser. viii. 105 (1908) (nomen).

Jelskiana has cylindric slender culms (0.5–1.0 mm. wide), narrow spikelets not exceeding 2.5 mm. wide, and green appressed linear scales with darkened margins. The dull black achene (2 mm. long) has about 12 rows of poorly-defined hexagonal cells, the apex constricted below the conical style-base. The type of *E. Sagotii* is similar, except that the achenes are immature and yellowish.

19. E. PLICARHACHIS (Griseb.) Svenson [PL. 537, FIG. 1; MAP 9]; RHODORA xxxi. 158 (1929). *E. elata* Boeckl. *E. Sagotii* var. *glochidiata* C. B. Clarke, Kew Bull. Add. Ser. viii. 21 (1908).—CUBA: Pinar del Rio, *C. Wright* no. 3372 (NY); Mordazo, Santa Clara, *León & Cazanes* no. 5980 (NY). MEXICO: Tabasco, *Rovirosa* no. 438 (NY). PANAMA: Frijoles (Canal Zone), *Svenson* no. 433 (B). BRITISH GUIANA: *Jenman* no. 6111 (K (TYPE of *E. Sagotii* var. *glochidiata*), NY); Moruka River, Pomeroon Distr., *De La Cruz* no. 993 (NY); Wanama River, Northwest Distr., *De La Cruz* no. 4003 (NY). VENEZUELA: Maracaibo, *Merkel* (Cop, TYPE of *E. elata*). COLOMBIA: Puerto Berrio, Dept. Antioquia, *Pennell* nos. 3727 (NY); 3733 (NY). PERU: Yurimaguas, Dept. Loreto, alt. 125 m., *Killip & Smith* no. 27962 (NY, US). BRAZIL: Fazenda de Sta. Cruz, *Glaziou* 9338 (Paris, as *E. variegata*). PARAGUAY: Ipacaray, *Hassler* no. 12570 (G, K).

The type of *E. elata* consists of two very old sheets from Hornemann's herbarium, collected in Maracaibo. They show no indication of Brazilian origin.

Series 2: PAUCIFLORAE

[For nos. 20–24 see index to species, and RHODORA xxxvi. 377–389 (1934)].

25. E. MELANOMPHALA C. B. Clarke [PL. 539, FIG. 4]. Perennial with a lignescent base; culms inflated and spongy, 10–16 cm. long, 1 mm. wide; sheaths loose, stramineous, purplish at the base and at the obtuse oblique apex: spikelets ovoid, 5–6 mm. long, loosely 5–10-flowered: scales lustrous brown, obtuse to subacute, the lowermost with a broad greenish keel: stamens 3, anthers 1.5 mm. long: style 3-fid: achene broadly ovoid, 2.0 mm. high, 1.5 mm. wide, bluntly trigonous, stramineous, lustrous, with minute quadrangular-to-hexagonal reticulation: style-base small, black, short-pyramidal, not constricted at the base: bristles dark brown, half as long as the achene or rudimentary.—Engler, Bot. Jahrb. xxx. Beibl. 68: 24 (1901); Barros, Mus. Hist. Nat. Buenos Aires xxxiv. 468, fig. 21 (1928); Svenson, RHODORA xxxvi. 383 (1934).

The illustration from the COTYPE at the New York Botanical Garden has been added in order to round out the treatment of the

Pauciflorae. *E. melanomphala* represents the extreme of the *E. pauciflora* complex in South America, being characterized by unusual width of achene, and by the peculiar style-base. Since only a single collection is known, its articulation with *E. atacamensis*[1] is obscure.

Series 3: ACICULARES

One way to treat this group is to place everything under *E. acicularis*, as many recent authors have done. No further discrimination is then required. Personally, I feel that the name *E. acicularis* should be restricted to slender plants of holarctic distribution, and that the plants of Mexico and the southern hemisphere (except for some obviously introduced examples in Australia) do not belong under *E. acicularis*. The dwarf alpine plants of the Andes and Mexico have been the greatest source of trouble, but after a considerable amount of boiling and dissecting, a fairly satisfactory conclusion has been reached, although I do not yet understand where *E. bonariensis* begins either in South America or in Mexico. The high Andean material (*E. exigua*), as Kunth observed in 1837, has two stamens instead of three (cf. pl. 539, fig. 9c) with anthers much reduced in size; the bristles when present are coarser than in *E. acicularis*. These characters hold well in the material which I have examined, to which may be added the fact that the Andean material has a totally different appearance than the European. *E. radicans* (*E. Lindheimeri*), *E. cancellata*, and *E. bella* also have consistently *two* stamens; other species of the *Aciculares* (perhaps excepting *E. brachycarpa* which I have not recently examined) have *three*. In the accompanying map of the *Aciculares* (MAP 1), the limits of distribution in Eurasia (*E. acicularis*) have been worked out from various floras. It is probable that *E. acicularis* does not occur throughout the interior of the Scandinavian peninsula. Also, despite reports, the group is probably absent through much of Patagonia. The link which I have shown connecting Colombia and Mexico is generalized, and represented by only one or two collections.

26. E. EXIGUA (HBK) R. & S. [PL. 539, FIGS. 5, 9c]. MAP 54. Dwarf plants with extensive filiform creeping rootstocks; culms 2–10 cm. high, capillary, frequently rigid and recurved, variously-angled: sheaths scarious, often dilated or emarginate at the apex: spikelets 2–3 mm. long. ovate to linear, *3–8 flowered:* scales obtuse or acute, *obri-*

[1] Treated by me under *E. pauciflora* (l. c.), of which it forms a fairly well-marked variety.

ously striate, green, sometimes with broad purple margins: *stamens 2; anthers 0.5 mm. long*, constricted at apex: achenes 1 mm. long, oblong-obovate, yellowish-green, obscurely trigonous with the intermediate longitudinal ribs frequently elevated, about 40-trabeculate in each longitudinal series: style-base usually acute: bristles 2, white, often absent.—Syst. ii. 154 (1817). *Scirpus exiguus* HBK. Nov. Gen. et Sp. i. 225 (1816). *E. costulata* sensu Svenson, RHODORA xxxi. 204, not Nees & Meyen. *E. rivularis* Phil. Linnaea xxxiii. 270 (1864–65); Boeck. Linnaea xxxvi. 427 (1869–70).—COLOMBIA: in monte Quindiu [Central Cordillera, 5° N.] (Berlin, TYPE of *Scirpus exiguus*); Bogota, *Lindig* no. 1425 (K); Bogota, "alt. 2650, Nov. 1855," *Triana* no. 430 (K, US). ECUADOR: Mt. Chimborazo, 2680 m., *André* no. 4272 (K); Huigra, Prov. Chimborazo, 1200 m., A. S. *Hitchcock* no. 20352 (NY) and *Rose* no. 22415 (NY); Quito, *Jameson* (K) and *Spruce* no. 5206 (K); Riobamba, *Mille* no. 338 (NY). BOLIVIA: Comarapa, Dept. Cochabamba, *Steinbach* no. 8521 (NY). CHILE: *Cuming* (K); Valparaiso, *Jaffuel* no. 759 (G); Conception, *Jaffuel* no. 2955 (G).

The type of *Scirpus exiguus* (hb. *Willdenow* no. 1168) is a poor and sprawling specimen with flaccid culms, 5–6-flowered spikelets (3 mm. long) with divergent purplish-banded scales, and rather broad achenes with short conical style-base. Jaffuel's specimens from Chile, with black spikelets and two stamens with anthers 0.5–0.7 mm. long, conform to the description of *E. rivularis*. Philippi's type of *E. rivularis* came from the Aconagua River near S. Rafael.

27. E. RADICANS (Poir.) Kunth, Enum. ii. 142 (1837) [PL. 539, FIG. 9a; MAP 61]. *Scirpus radicans* Poir. Encyc. vi. 751 (1804). *Eleogiton radicans* A. Dietrich, Sp. Pl. ii. 97 (1833). *Eleocharis costulata* Nees & Meyen ex Kunth, Enum. ii. 142 (1837); (?) Desvaux in C. Gay, Fl. Chil. vi. 172 (1853), not Svenson, RHODORA xxxi. 204 (1929). *Chaetocyperus costulatus* Nees & Meyen (1842); (RHODORA, l. c.). *E. Lindheimeri* (Clarke) Svenson, RHODORA xxxi. 199 (1929).—PORTO RICO: *Ledru* (TYPE not seen). HAITI: Furcy, 1300 m., *Leonard* no. 4812 (NY). SANTO DOMINGO: Cordillera Central (2500 m.), *Ekman* nos. 14130 (S) & 13650 (S); Sierra de Ocoa, *Ekman* no. 11936 (S); Santiago, *Ekman* no. 16534 (S). PERU: *Dombey* in 1829 (Berlin). CHILE: Cordillera de St. Fernando, *Meyen* in 1831 (TYPE of *Ch. costulatus*), dwarf plants 3 cm. high (Berlin); Valdivia, *Philippi* (K); Valparaiso, *A. Pirion* no. 757 (in part) (G). ARGENTINA: Sierra Achala, Cordoba, *Hieronymus* no. 642 (Berlin, K) (a large form with culms to 10 cm.; no bristles); Tucuman, *Hieronymus* & *Lorentz* no. 1074 (Berlin); Catamarca, *H. & L.* nos. 434, 474 (Berlin); Tucuman, Dept. Alta Cruz, *Venturi* no. 2283 (US, B) & Dept. Leales, *Venturi* no. 597 (US, B); Jujuy, Dept. San Pedro, *Venturi* no. 9643 (NY); Posados, Misiones, *Ekman* no. 1244 (NY). URUGUAY: Dept. Canelones, *Osten* no. 21635 (B); Montevideo, in paludosis dunarum, *Osten* no.

22515 (B) (dwarf rigid form, issued as *E. acicularis* var. *lilliputiana*); Bañados, *Lorentz* no. 453 (K, as *E. retroflexa*).

E. radicans is the only member of the *Aciculares* known from the West Indies, and there only in Porto Rico and Haiti. In North America it is sporadic (see Professor Fernald's map in RHODORA XXXIX. 483 (1937)); but in Argentina apparently not uncommon, though until recently I had seen no specimens. The stamens are 0.3–0.5 mm. long and sometimes mucronate as in Desvaux's illustration, which is perhaps correctly referred to *C. radicans* by Clarke (Engler, Bot. Jahrb. XXX. Beibl. 68: 22 (1901)). The bristles are often short or entirely lacking.

28. E. BONARIENSIS Nees in Hook. Journ. Bot. ii. 398 (1840) [MAP 59]; Svenson, RHODORA XXXI. 202 (1929). *Chaetocyperus bonariensis* Nees in Martius, Fl. Bras. ii[1]. 96 (1842). *C. obtusatus* Nees (l. c.) p. 94; Steud. Syn. Cyp. 73 (1855). *E. acicylariformis* Greenman, Proc. Am. Acad. XXXIV. 566 (1899); Svenson, RHODORA XXXI. 202 (1929). *E. acicularis* subsp. *bonariensis* Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2a, iii. 173 (1936).

The European *E. acicularis* (cf. PL. 539, FIG. 1) has, in general, dwarfed capillary culms, fragile, non-costulate elongate achenes, 1 mm. long, with a small acicular style-base. The TYPE of *E. bonariensis* (hb. Lindley, Cambridge) is a small plant with rather coarse rhizome and purplish scales, but the species varies greatly in size. Tweedie's plant at Kew has filiform culms up to 37 cm. long, and somewhat distichous spikelets with blunt, yellowish-green, slightly erose scales, and with a firm incurved sheath-apex, resembling a quill pen. *E. squamata* Boeckl. Cyp. Nov. ii. 11 (1890) was based on young material (hb. Berlin) collected in Minas Geraes by Schenck. The numerous culms are only 6 cm. high, sheaths somewhat inflated but not mucronate, and scales much as in typical *E. tenuis*. It is possibly a juvenile collection of what I have called *E. squamigera*, but does not belong with *E. bonariensis* (cf. Barros, op. cit. p. 450). The type collection of *Ch. obtusatus* (Berlin, hb. *Nees* no. 1722) is an immature, dwarf (7 cm. high) specimen of *E. bonariensis*, with fan-shaped obtuse lower scales.

E. striatula Desv. has been included by Clarke under *E. bonariensis* (Engler, Bot. Jahrb. XXX. Beibl. 68: 22 (1901)) and this treatment is substantiated by Gay's illustration and Desvaux's specimens at Paris and at Kew. The spikelets are approximately 15-flowered, with brown-rimmed, obtuse scales; the achenes measure slightly over 1.0 mm. long, with blunt enlarged tubercles. In large Mexican specimens of the *Aciculares*, the scarious character of sheaths is inconstant.

E. acicullariformis should be treated as a synonym of E. BONARIENSIS, with the additional MEXICAN citations: Durango, *E. Palmer* no. 386 in 1896 (NY); Valle de Mexico, *Schaffner* no. 21 (NY) (as *E. striatula*). Additional citations for *E. bonariensis:* BRAZIL: Rio Grande do Sul, *Schwarzer* in 1899 (S). ARGENTINA: Cordoba, *Kurtz* no. 6635 (NY) and *O. Kuntze* no. 36 (NY); also *Stuckert* nos. 241 (K), 7614 (K); La Cumbre, 1200 m., *Barros* no. 1743 (B); Chicligasta, Tucuman, *Lillo* nos. 15542 (B), 15538 (B); Buenos Aires, *Barros* nos. 124 (B), 226 (B); Palermo, Capital Federal, *Barros* nos. 58 (B), 631 (B), 640 (B); Salta, *O. Kuntze* no. 35 (NY). URUGUAY: Canelones, *Osten* no. 20070 (B); Maldonado, locis humidis in dunis, *Osten* no. 22686 (B); Carrasco, Montevideo, *Osten* no. 22304 (B); San José, *Osten* no. 22715 (B). PARAGUAY: Rica, *Joergensen* no. 3581 (US, B); Asuncion, *Morong* no. 87 (NY). CHILE: Rancagua, *Bertero* no. 613 (NY); Talcahuano, Conception, *Skottsberg* no. 1167 (NY).

29. E. STENOCARPA Svenson [MAP 56], RHODORA XXXI. 205 (1929).—Additional citations: •VENEZUELA: San Rafael, Mérida, *Pittier* nos. 12895 (NY) & 13218 (NY). COLOMBIA: Paramo de Romeral, Santander, 3800–4100 m., *Killip & Smith* no. 18520 (NY).

30. E. NERVATA Svenson [MAP 60], RHODORA XXXI. 204 (1929). *Chaetocyperus radicans* Steud. Syn. Cyp. 74 (1855). *Heleocharis radicans* (Steud.) Hemsley, Biol. Cent.-Am. Bot. iii. 456 (1885), not R. & S. *H. acicularis* Hemsley, (op. cit.) iii. 454 (1885) (partim). Previous citations from Ecuador should be excluded and the following added: MEXICO: Oaxaca, 8–9000 ft., *Galeotti* no. 5748 (K, COTYPE of *Ch. radicans*); in summo Monte San Felipe, ubi glacier apotheca, Oaxaca, *Andrieux* no. 49 (K) (NY?); Eugenio, Orizaba, *F. Mueller* no. 1973 (Sept. 1853) (NY); *Mueller* (sine loc.) no. 1975 (NY). GUATEMALA: Santa Elena, Chimaltenango, 2400–2700 m., *Skutch* no. 429 (NY, US). Boeckeler's specimen of *E. triflora* at Berlin is *E. nervata;* the TYPE at Copenhagen is *E. parvula* var. *anachaeta.*

The small alpine Mexican plants passing as *E. acicularis* have three stamens with anthers rather consistently 0.7 mm. long. Very likely a transition occurs between the smaller plants of *E. acicullariformis* and the type of *E. nervata* (similar to Skutch's collection), thence to dwarf, capillary material such as the type of *Chaetocyperus radicans,* with achenes often only 1.0 mm. long. *C. radicans* was described quite independently of *Eleocharis radicans* (HBK) R. & S.

31. E. BRACHYCARPA Svenson, RHODORA XXXI. 200 (1929).

32. E. CANCELLATA S. Wats.; Svenson, RHODORA XXXI. 200 (1929).

It is not certain that the Mexican Boundary Survey actually collected this species in New Mexico, since they also visited Sonora, from which there is a collection June, 1851, *Thurber* (NY).

33. E. BELLA (Piper) Svenson [MAP 53], RHODORA XXXI. 201 (1929).

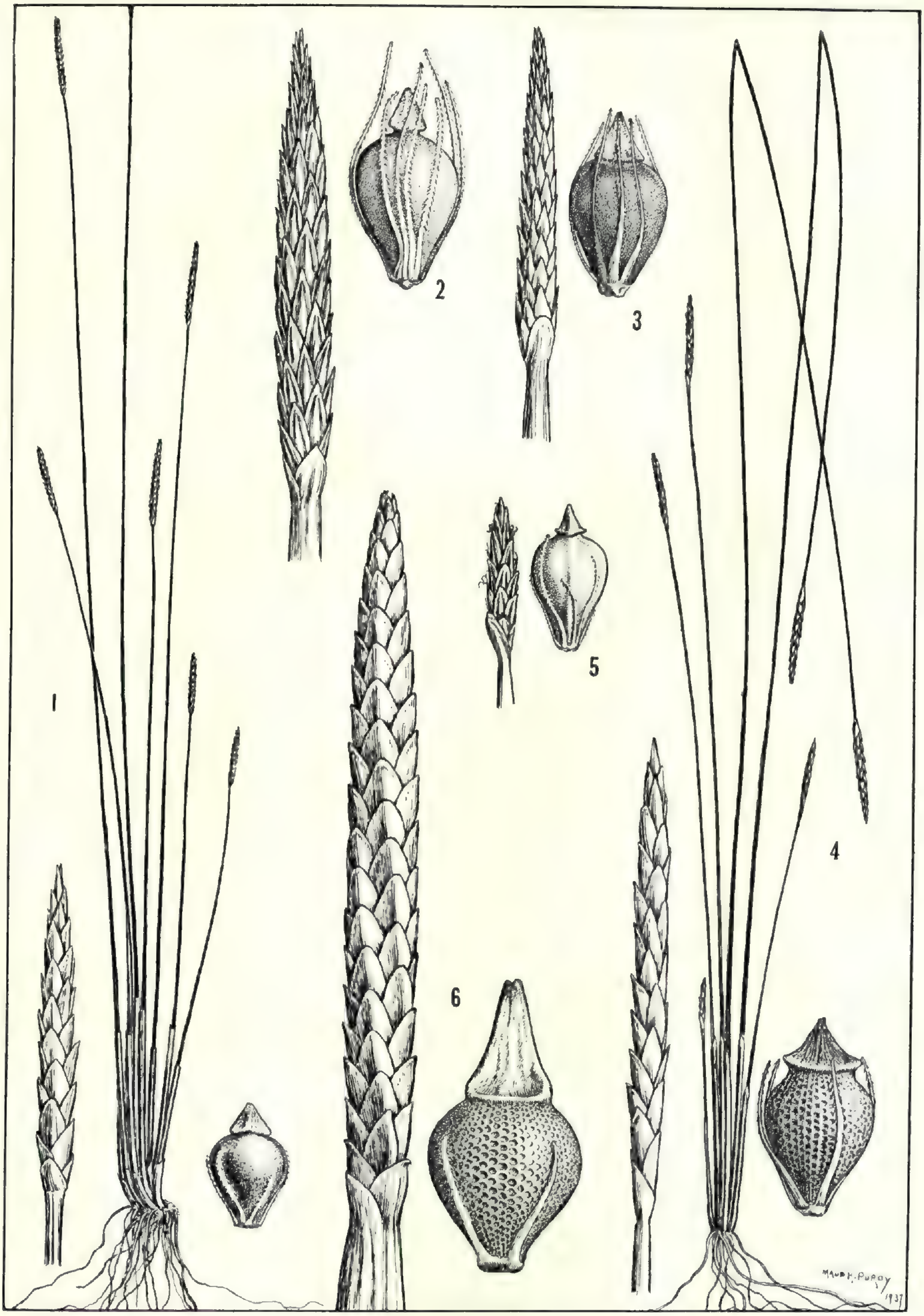
Additional citations: WASHINGTON: Klickitat Co., *Suksdorf* no. 588 (NY). OREGON: Crow Creek, Wallowa Co., alt. 4425 ft., *E. P. Sheldon* no. 8506 (NY). NEVADA: Truckee River bottom, Glendale, *Hillman* in 1894 (NY). CALIFORNIA: Moulton, Warner Mts. [Modoc Co.], *Griffiths* & *Hunter* no. 478 (NY); near Calaveras Big Trees, *Dudley* in 1906 (NY); Mt. Shasta, *H. E. Brown* no. 543 (NY); Jonesville, Butte Co., *Copeland* no. 344a (NY). MONTANA: Lola Hot Springs, *J. E. Kirkwood* no. 1548 (hb. Oberlin Coll.), a noteworthy range extension.

34. E. REVERCHONII Svenson [MAP 57], RHODORA XXXI. 203 (1929).—Additional citations: TEXAS: San Diego, *Nealley* in 1893 (NY); "Hogbed prairie," *C. Wright* no. 512 (NY); prairie near Indianola [Port Lavaca], *Ravenel* no. 96, May 3, 1869 (NY); San Antonio, *C. R. Ball* no. 947 (NY); Valley of the Lower Rio Grande, *Buckley* (NY).

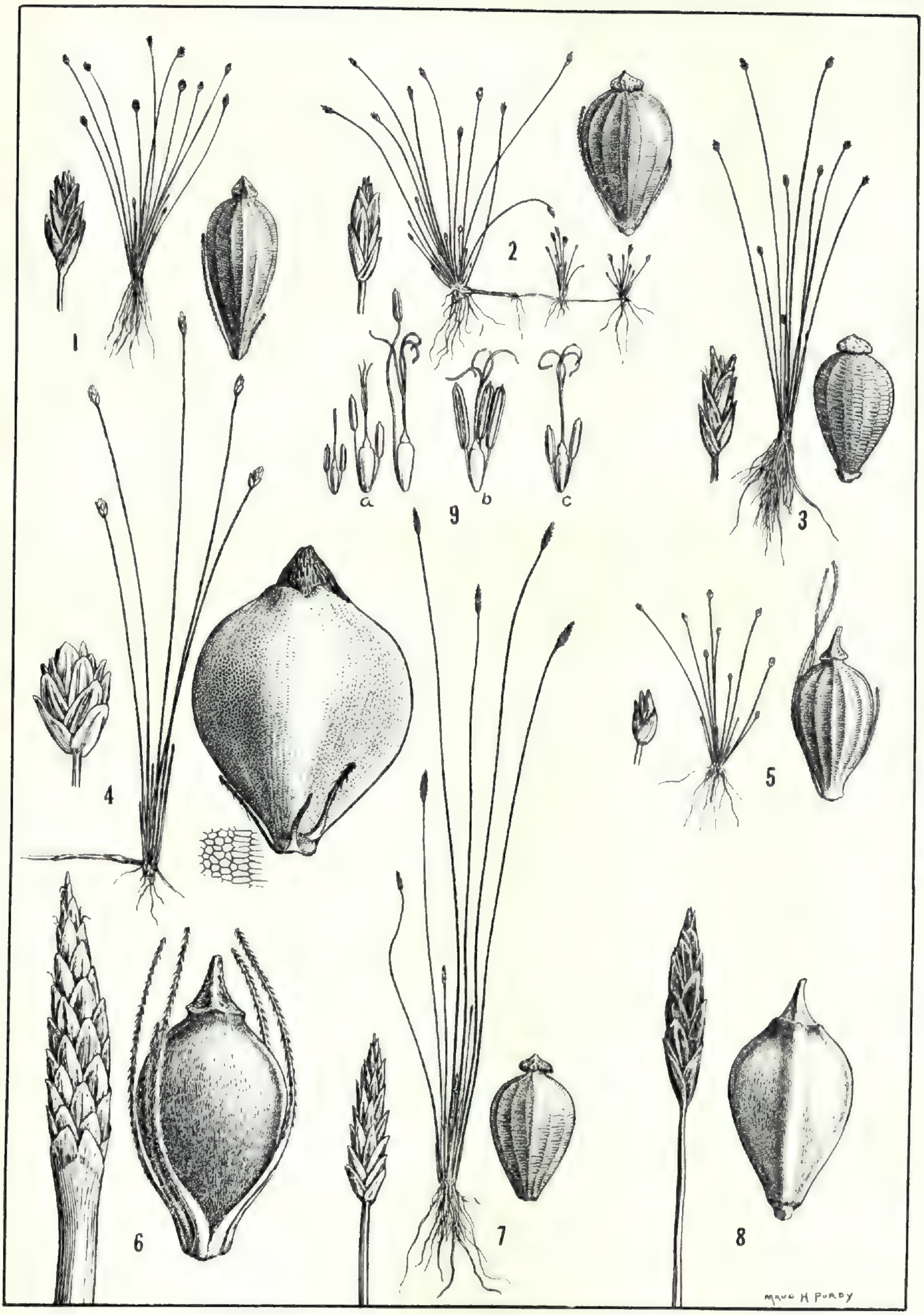
Examination of better material shows that mature achenes average 0.7 mm. long and the three stamens have anthers 0.7–1.0 mm. long. The style-base is blunt and rounded. Nealley's collection is perhaps most representative of the species, having a long rhizome with isolated tufts of culms which are 2–6 cm. high; therefore much shorter than the elongated form originally described.

35. E. WOLFII A. Gray [MAP 58]; Svenson, RHODORA XXXI. 201 (1929).—Added citations: NEW YORK: Train's meadow swamp, Woodford, Long Island, *Ferguson* in 1927 (NY) (station now destroyed). TENNESSEE: French Broad River, *Buckley* (NY). LOUISIANA: Jackson, East Feliciana, *Carpenter* in 1837 (NY) (cited as *E. compressa*). COLORADO: Black Forest, El Paso Co., *J. H. Christ* no. 1029 (Cornell). ASSINABOIA: Crane Lake, *Macoun* no. 7548 (NY).

36. E. ACICULARIS (L.) R. & S. [PL. 539, FIGS. 1, 9b; MAP 55]; Svenson, RHODORA XXXI. 184 (1929). (?) *Scirpus yokoscensis* Fr. & Savat. Enum. Pl. Jap. ii. 543 (1879). *E. comosa* C. Richt. Pl. Europ. i. 143 (1890).—Additional citations (showing limits of known range in America): GREENLAND: 68°–72° N., cf. Porsild, Meddel. Groenl. Bd. 93, no. 3: 33 (1935). LABRADOR: Nascaupee River, Hamilton Inlet, cf. Wetmore, RHODORA XXV. 5 (1923). ONTARIO: James Bay, *Macoun* in 1904 (NY); Moose Factory, James Bay, *Spreadborough* no. 62669 (Can); Timagami Forest Reserve, *W. R. Watson* nos. 370 (Can), 455 (Can). MANITOBA: Rapid City, *Macoun* no. 16359 (Can). ALBERTA: Forestburg, *E. H. Moss* no. 1452 (Kew); Crows Nest Pass, Rocky Mts., *Macoun* no. 23174 (Can). SASKATCHEWAN: Cumberland House, *Richardson* (NY). OKLAHOMA: Coal Creek Camp [Le Flore Co.], *Bigelow* in 1853 (NY). ALASKA: Fairbanks, *J. P. Anderson* no. 1495 (NY); Bonanza Creek, Yukon, *Macoun* in 1902 (NY). FLORIDA: Lake Jackson [Tallahassee Co.], *Spury* no. 544 (US). NORTH CAROLINA: Raleigh, *Blomquist* no. 5556 (Duke); Yadkin River, Davidson County, *Blomquist* no. 5557 (Duke). GEORGIA: Princeton,



Eleocharis (habit × ½, spikelets × 2, achenes × 10). Fig. 1, E. pallens. Fig. 2, E. acuta. Fig. 3, E. plana. Fig. 4, E. nuda. Fig. 5, E. Dietrichiana. Fig. 6, E. Brassii.



Eleocharis (habit × ½, spikelets × 2½, achenes × 20). Fig. 1, E. acicularis. Fig. 2, E. pusilla. Fig. 3, E. acicularis var. occidentalis. Fig. 4, E. melanomphala. Fig. 5, E. exigua. Fig. 6, E. limosa. Fig. 7, E. acicularis var. gracilescens. Fig. 8, E. Baroni. Fig. 9, Flowering stage of: a) E. radicans, b) E. acicularis, c) E. exigua.

Clarke Co., *Harper* in 1897 (B). KENTUCKY: Hodgenville, *Svenson* no. 4410 (B).

E. ACICULARIS var. GRACILESCENS Svenson, RHODORA xxxi. 191 (1929) [PL. 539, FIG. 7]. *Isolepis longifolia* Steud. Syn. Cyp. 90 (1855).

The TYPE of *I. longifolia* (Paris) is a specimen collected at St. Louis by *Kampmann* [?] (hb. *Riehl* no. 349). As seen in middle Tennessee, where it occupies shallow ponds in competition with *E. quadrangulata*, the variety is strikingly different from the ubiquitous *E. acicularis* of the northern states.—TENNESSEE: Pelham, Grundy Co., *Svenson* 7608 (B); McMinnville, Warren Co., *Svenson* no. 7038 (B). About the California citations of var. *gracilescens* I am not so confident. Further collecting will probably show that they are elongated forms of var. *occidentalis*.

37. E. PUSILLA R. Br. Prod. 225 (1810) [PL. 539, FIG. 2]; Benth. & Mueller, Fl. Austral. vii. 297 (1878). *Scirpus pumilio* Spreng. Syst. i. 204 (1825).

The TYPE (*R. Brown* no. 5931), in the British Museum of Natural History, is a very young specimen of the *Aciculares*, with hardened semi-bulbous culm-bases, and with the rhizome lacking. The spikelets are 4 mm. long, scales deep brown, anthers 1.5 mm. long. The illustration is from *S. T. Blake*, no. 4943 (B) collected in grassland, Gatton Agricultural College, southeast Queensland.

(To be continued)

SOME ALGAL COMPLEXITIES[1]

V. J. CHAPMAN[2]

A. RHIZOCLONIUM TORTUOSUM (DILLW.) KÜTZ. AND CHAETOMORPHA TORTUOSA KÜTZ.

DILLWYN in his British Confervae (1805) described a filamentous green alga which he named *Conferva tortuosa*. In 1845 and 1849 Kützing described two plants, one founded on Dillwyn's *Conferva tortuosa* and the other on *C. tortuosa* J. Ag. *non* Dill. One of these plants—with filaments 32–35 μ dia.—he referred to *Rhizoclonium* (1845). The other plant was placed in the genus *Chaetomorpha* (1849) and the filaments were described as being 46–56 μ.

[1] The American material was collected during the author's tenure of a Henry Fellowship at Harvard in 1935–36.

[2] Drosier Research Fellow of Gonville and Caius College, Cambridge, England.

Apart from the somewhat regrettable founding of two species with the same specific name in two very closely allied genera Kützing distinguished clearly and adequately that there were two distinct plants. Later authors, however, have often confused the two completely, some recognising only *Rhizoclonium tortuosum* and including in it the large forms, and others recognising only *Chaetomorpha tortuosa* and including in it the narrow forms.

There is no great difficulty in distinguishing between the extremes of the genera *Rhizoclonium* and *Chaetomorpha*. *Rhizoclonium riparium* with its rhizoidal branches is a completely distinct species from such as *Chaetomorpha aerea* or *Chaetomorpha linum*. Both genera, however, possess species which are excessively difficult to demarcate. In particular, there are *Rhizoclonium tortuosum* and *Rhizoclonium implexum*, both without any rhizoidal branches and with the same loose-lying habit. *Chaetomorpha tortuosa* also occurs in loose-lying masses, unbranched, and with cells whose diameter is only very slightly more than that of either *Rhizoclonium tortuosum* or *R. implexum*. Hence the great confusion in the literature. It may be doubted, indeed, whether there is any real justification for the genus *Chaetomorpha*. It could be argued that the three almost cosmopolitan species cited above are relics of a common parent stock, and that subsequently this group has evolved along two separate paths, one leading to the extreme *Chaetomorpha* type, the other to the extreme *Rhizoclonium* type. If it were not for the existence of these "übergang" species the two genera could be completely separated, but as these 'bridge' forms exist it may seem preferable in the future to regard all these species—both *Rhizoclonium* and *Chaetomorpha*—as belonging to one genus. A cytological investigation might be expected to throw some light on this problem.

An attempt has been made by the present author to unravel the tangle of synonymy surrounding *Rhizoclonium tortuosum* and *Chaetomorpha tortuosa*, and whenever possible authentic specimens of the early authors have been re-examined.[1]

RHIZOCLONIUM TORTUOSUM (Dillw.) Kütz. *Conferva tortuosa* Dillw. Brit. Conf. Fasc. 7. London 1805; C. Ag. Syst. Alg. p. 98. Lund 1824. *Conferva implexa* Harv. Phyc. Brit. Tab. 54B. 1846. *Rhizoclonium tortuosum* Kütz. Phyc. Germ. p. 205. Nordhausen 1845; Spec. Alg. p.

[1] I am grateful to Professor H. H. Dixon of Trinity College, Dublin, and Mr. Tandy of the British Museum for facilities in this connection, and to the latter, in addition, for helpful criticism in technical details.

384. Leipzig 1849; Tab. Phyc. Vol. 3. T. 68. i. 1853; Le Jol. Alg. Mar. Cher. p. 58. Paris 1880; Hauck, Meeresalg. in Rabenhorst's Krypt. Flora. p. 443. Leipzig 1885; De Toni, Syll. Alg. Vol. 1 p. 280. Patavii 1889. *Rhizoclonium hieroglyphicum* var *tortuosum* Stockm., Über die Algengattung *Rhizoclonium*. Verh. K. K. Zool. Bot. Gesell. in Wien. Vol. 40, p. 583. 1890; West, Alg. Vol. 1 p. 268. Cambridge 1916.

Exsiccatae: *Conferva implexa* Wyatt. Alg. Dan. No. 142. *Rhizoclonium riparium* var. *validum* Nord et Witt. No. 624. *Rhizoclonium rigidum* Nord et Witt. No. 626 *pro parte.*

It is probable that *Rhizoclonium tortuosum* Kütz. in Phyc. Germ. includes *R. implexum* because in the two subsequent works Kützing separated off the latter as a new species.

One difficulty about this species is that most American Phycologists have regarded *Rhizoclonium tortuosum* as being synonymous with *Chaetomorpha tortuosa* (Farlow 1881; Collins 1909; Setchell and Gardner 1920; Taylor 1937). According to Dillwyn (1805) the type specimen is in Dillwyn's seventh fascicle, but a search in the Linnean Society's rooms only produced the first four fascicles. However, there is an authentic Dillwyn specimen in the British Museum and this was examined. The cells ranged from 34–48 μ wide with an average width of 40 μ. Therefore so far as diameter is concerned, it would appear to be intermediate between the usually accepted dimensions of *Rhizoclonium tortuosum* and *Chaetomorpha tortuosa.* The cells were 1–2 times as long as broad, the chloroplasts were light green, and I think the plant may properly be regarded as *Rhizoclonium tortuosum* in the sense of Kützing. The chloroplasts of *Chaetomorpha tortuosa,* on the other hand, are usually dark green in colour. Dillwyn rather surprisingly remarks that his plant is closely allied to *Conferva capillaris* (*Chaetomorpha linum*) but this is hardly the case.

The usually accepted dimensions of *Rhizoclonium tortuosum* are 32–35 μ. From specimens which have been examined it would appear that the range is much greater, 30–48 μ and the average length of the cells is about 1½ times as long as broad. Hauck (1885) gives the diameter as 25–40 μ but he probably included in this assemblage *Rhizoclonium implexum* whose threads are narrower than *Rhizoclonium tortuosum*. Stockmayer (1890) gives the diameter as 26–40 μ but he certainly included *Rhizoclonium implexum* because he cites it as one of the synonyms. He further regarded his *Rhizoclonium tortuosum* as being synonymous with *Conferva tortuosa* Harv. but not with *C. tortuosa* Dillw., and also synonymous with *Rhizoclonium tortuosum* of

Farlow, whereas both these should properly be referred to *Chaetomorpha tortuosa*. He is, however, correct in giving the *Rhizoclonium tortuosum* of Hauck (1885) and Le Jolis (1863) as synonymous. Both Stockmayer and De Toni confused the issue by wrongly ascribing *Chaetomorpha tortuosa* Kütz. to *Conferva tortuosa* Dillw. Stockmayer adopted the name *Rhizoclonium hieroglyphicum* Kütz. for a group of existing species (*Rhizoclonium riparium*, *R. implexum* and *R. tortuosum* and considered each to be a variety of this one species. This is probably his most valuable contribution to the study of the genus.

The *Rhizoclonium tortuosum* described by Collins (1909), Farlow (1881), Harvey (1846), Setchell and Gardner (1920), and Taylor (1937) is to be taken as *Chaetomorpha tortuosa*.

Authentic specimens of *Conferva tortuosa* and *Conferva implexa* from Harvey's collection have been examined. The specimens of *Conferva tortuosa* all belong without doubt to the genus *Chaetomorpha*.

Setchell and Gardner were correct in making the above assumption but hardly correct in assuming *Conferva tortuosa* Harv. to be synonymous with Dillwyn's *Conferva tortuosa*. It is to be noted that the cells are by no means barrel-shaped as they should be for a true *Chaetomorpha*—and they are not even drawn so in Harvey's Plate (54A). The cell diameters ranged from 40–80 μ.

Harvey's *Conferva implexa* is a little more puzzling. His description is clearly that of *Rhizoclonium tortuosum* but the plate (54B) shows the barrel-shaped cells of a *Chaetomorpha* and one specimen—from Malahide, Co. Dublin—undoubtedly is *Chaetomorpha tortuosa* (cells 60–68 μ dia.), although in his description he gives the diameter of the species as two thirds that of *Chaetomorpha tortuosa* (e.g. two thirds of 60 μ = 40 μ). The other specimens of Harvey under *C. implexa* were referable to *R. tortuosum*. It may be suggested that Harvey was perhaps not quite clear about these two species, but he did realise that there were two and he described them correctly even though one of his specimens was misnamed. *Conferva implexa* Harv. from his description and other specimens must be taken as synonymous with *Rhizoclonium tortuosum* (Dillw.) Kütz. Many of Harvey's synonyms for *Conferva implexa* probably refer to forms which are now regarded as *Rhizoclonium implexum*.

Rhizoclonium tortuosum in Rabenhorst (1885) is correctly so named by Hauck but the synonyms are doubtful because they are copied from Harvey. The reference to Harvey's plate (54A) is misleading,

since, as shewn above, this depicts *Chaetomorpha tortuosa*. The diameter of the threads is given as 26–40 μ and this must signify the inclusion of *Rhizoclonium implexum*. I have examined a specimen of *Conferva implexa* from Wyatt's Alg. Dan. and it is undoubtedly *Rhizoclonium tortuosum* with threads 35–45 μ dia. A plant labelled *Chaetomorpha tortuosa* (from Jersey) in Herb. J. Gay is also *Rhizoclonium tortuosum* (threads 32–40 μ diam.). The walls only exhibited thickening at the septa and this appears to be characteristic of the species. When *Rhizoclonium riparium* var. *validum* Nord. et Witt. no. 624 was examined the threads were found to be 28–40 μ wide, average width 32 μ which places the specimen as *Rhizoclonium tortuosum*. *R. rigidum* Nord. et Witt. No. 626 appears to be a mixture of two plants in one of which the threads are 32–40 μ and hence this part of the specimen must be regarded as *R. tortuosum*.

CHAETOMORPHA CAPILLARIS (Kütz.) Börg. [*Conferva tortuosa* J. Ag. Alg. Med. et Adr. p. 12. Paris 1842. *non* Dillw.; Harv. Phyc. Brit. T. 54A. 1846; Harv. Ner. Bor. Amer. Part III. Smithson. Contr. Knowl. Vol. xi. p. 88. T. 46 B. 1858]. *Rhizoclonium capillare* Kütz. Diagnosen und Bemerkungen zu Neuen oder Kritischen Algen. *Bot. Zeit.* vol. 5. p. 166. 1847. [*Chaetomorpha tortuosa* Kütz. Spec. Alg. p. 376. Leipzig 1849; Tab. Phyc. Vol. 3. T. 51.2. 1853; Hauck, Meeresalg. in Rabenh. Krypt. Flora. p. 439. Leipzig 1885; De Toni, Syll. Alg. Vol. 1 p. 266. Patavii 1889; Foslie, M. Contrib. to Knowl. Mar. Alg. Norw. p. 142. Trömsö 1890; Newton, L. Handb. Brit. Seaw. p. 91. 1931]. *Chaetomorpha Callithrix* Kütz. Spec. Alg. p. 376. Leipzig 1849; Tab. Phyc. Vol. 3. T. 51. 1. 1853. *Chaetomorpha mediterranea* Kütz. Spec. Alg. p. 381. Leipzig 1849. *Spongopsis mediterranea* Kütz. Phyc. Gen. p. 261. Leipzig 1843; Tab. Phyc. Vol. 3. T. 50. 1853. *Rhizoclonium tortuosum* sensu Farlow, Mar. Alg. New Engl. p. 49. Washing. 1881; Collins, F. S. Green Alg. N. Amer. Tufts Coll. Stud. Vol. 2. p. 328. 1909; Setch. and Gard. Mar. Alg. Pac. N. Amer. Part II. Chlorophyceae. Univ. Calif. Pub. Bot. vol. 8. p. 185. 1920; Taylor, W. R. Mar. Alg. N. E. Coast of America. Univ. Mich. Press. p. 83. 1937. *Chaetomorpha capillaris* (Kütz.) Börg. Mar. Alg. Canar. K. Danske. Vidensk. Selsk. Biol. Meddel. p. 45 vol. V. 1925.

Kützing in his description of *Chaetomorpha tortuosa* (1849) refers *only* to J. Ag. Alg. Med. et Adr. p. 12. 1842. In this latter work J. Agardh refers his plant to *Conferva tortuosa* in Ag. Syst. Alg. p. 98., which in its turn is referred to *C. tortuosa* Dillw. (1805). Kützing however is careful to give only the reference to J. Ag. (1842) and he obviously considered that J. Agardh and C. Agardh were describing two different plants under the same name.

Both Foslie (1890) and De Toni (1889) wrongly ascribed *Chaetomorpha tortuosa* to *Conferva tortuosa* Dill.

Chaetomorpha capillaris as understood by most authors includes plants of diameter 40–100 μ, the average being 60–70 μ. Kützing in the original description gave the diameter of the filaments as 46–56 μ. The filaments are rigid, slender, much curled and twisted, the cells being one to three times as long as broad. The chloroplast is a bright dark green. The species has thicker, more lamellate walls than *Rhizoclonium tortuosum*. Farlow's (1869) description and synonyms apply to *Chaetomorpha tortuosa* with one exception; he remarks that branches are few and short, but this is probably the form later described by Holden as *f. polyrhizum*. Farlow incorrectly describes his plant as synonymous with *Conferva implexa* Harv. but is correct in making it synonymous with *C. tortuosa* Harv. Collins (1909) describes a *Rhizoclonium tortuosum* but the diameter of the cells is given as 40–70 μ which obviously refer it to *Chaetomorpha*. Collins further remarks that it is synonymous with *Conferva tortuosa* in Ner. Bor. Amer. He also remarks that his species is not the same as *Rhizoclonium tortuosum* of Hauck (1885). I have seen and examined Harvey's specimen (Bot. Survey of Maine A 37. Herb. A. Young Jr. 1847) from which the plate and description of *C. tortuosa* was made and it is undoubted *Chaetomorpha tortuosa*. The cells are 46–64 μ, average diameter about 56 μ: they are barrel-shaped and 1½–3 times as long as broad. I have examined other specimens of Harvey's and they also belong to *Chaetomorpha*. Some of these plants, however, have perfectly straight walls and are not barrel-shaped. Reference has already been made to the fact that although the description of *Conferva implexa* Harv. refers to *Rhizoclonium tortuosum* yet one specimen from Harvey's collection under this name belongs to *Chaetomorpha tortuosa*.

I have compared specimens of *Chaetomorpha tortuosa* collected by myself at Carmel Bay with specimens from Phyc. Bor. Amer. collected from the same station but distributed as *Rhizoclonium tortuosum*. The two sets agree perfectly, the cells are large, 48–80 μ dia., average 66 μ, and 2–6 times as long as broad, average 2½–3½ times. The chloroplast is the typical dark green colour. Setchell and Gardner describe rhizoids (rare) but I could not find any in either their specimens or mine. It was this feature that presumably induced them to place their plants in the genus *Rhizoclonium*. This fact only serves to emphasise the nebulosity of the dividing line between *Chaetomorpha* and *Rhizoclonium*.

Hauck (1885) correctly describes *Chaetomorpha tortuosa* as having cells 40–100 μ dia., and 1–2 times as long as broad.

Rhizoclonium implexum (Dillw.) Kütz. *Conferva implexa* Dillw. Brit. Conf. p. 46 T. B. London 1809; C. Ag. Syst. Alg. p. 91 Lund 1824. *Rhizoclonium implexum* Kütz. Spec. Alg. p. 386. Leipzig 1849; Tab. Phyc. Vol. 3. T. 73. 3. 1853; Batters, List of the Marine Algae of Berwick on Tweed in Hist. Berwicksh. Natur. Club. Vol. 12. p. 230. 1890; Setch. and Gard. Mar. Alg. Pac. N. Amer. Part II, Chlorophyceae. Univ. Calif. Pub. Bot. Vol. 8. p. 183. 1920; Newton, L. Handb. Brit. Seaw. p. 93. London 1931. *Rhizoclonium rigidum* Gobi. Algenfl. Weiss. Meer. p. 85. St. Petersburg 1878; Foslie, M. Contrib. to Knowl. Mar. Alg. Norw. p. 142. Trömsö 1890. *Rhizoclonium riparium* var. *implexum* Rosenv. Grön. Haval. p. 915. 1893; Saunders, T. de A. Mar. Alg. Harrim. Expd. Proc. Wash. Acad. Scien. Vol. 3 p. 414. 1901; Setc. and Gard. Alg. N. W. Amer. Univ. Calif. Pub. Bot. Vol. 1. p. 222. 1903; Collins, F. S. Green Alg. N. Amer. Tufts Coll. Stud. Vol. 2 p. 328. 1909; Taylor, Mar. Alg. N. E. Coast N. Amer. Univ. Mich. Press, p. 82. 1937.

Exsiccatae: *Chaetomorpha tortuosa* Wyatt. Alg. Dan. No. 190. *Rhizoclonium rigidum* Nord. et Witt. No. 626 *pro parte*.

Both Stockmayer (1890) and De Toni (1889) include this species in *Rhizoclonium tortuosum*.

So far as can be ascertained, by this species is meant a form very like *Rhizoclonium tortuosum:* unbranched, free-floating, twisted, entangled, but of slightly smaller dimensions. The cells are usually described as 20–30 μ dia. rarely more, and 1½–2½ times as long as broad. The descriptions provided in most of the recent literature undoubtedly refer to this species but again the synonymy is difficult to unravel. Newton (1931) describes it as synonymous with *Conferva implexa* Dillw., *Rhizoclonium tortuosum* Kütz., and *R. rigidum* Gobi. No specimen of Dillwyn's was examined but it must be assumed that Harvey's *Conferva implexa* cannot be identical with Dillwyn's *C. implexa* because Harvey's plant is undoubted *Rhizoclonium tortuosum*. Dillwyn's *C. implexa* must therefore stand although the close similarity between the two species is strengthened by a comparison of Dillwyn's figures of *Conferva tortuosa* and *C. implexa*. These are depicted as being of almost the same dimensions and the only difference appears to be in the length of the cells which are somewhat shorter in *Conferva implexa*. Examination of many specimens shews that cell-length is a variable, unstable, and unreliable character.

I have collected specimens from Nova Scotia which agree with the description of this plant but differ from it in that very rare *septate*

rhizoidal branches may occur (cf. fig. 1). Rhizoidal branches when they do occur in *Rhizoclonium implexum* are always said to be aseptate. On the other hand the Nova Scotian plant did not have the abundance of branches that is a feature of *Rhizoclonium riparium*.

Setchell and Gardner have reported *R. implexum* from the Pacific coast of America. They consider Harvey's *Conferva implexa* to be identical with their plants but it is now clear that *Conferva implexa* Harv. = *Rhizoclonium tortuosum* (Dillw.) Kütz. They point out that Kützing's *Rhizoclonium implexum* is given a diameter of 11–12 μ which probably relates it rather to *Rhizoclonium Kerneri* Stockm. They note, too, that their plants agreed with Alg. Dan. No. 142 (*Conferva implexa*) and No. 190 (*Chaetomorpha tortuosa*). The former, however, has threads 35–45 μ and is *Rhizoclonium tortuosum*, whilst the latter has threads 20–27 μ dia. with occasional rhizoids and is true *Rhizoclonium implexum*. Foslie (1890) made the same error with respect to No. 142. *R. rigidum* Nord. et Witt. No. 626 is a mixture of two species. One is referable to *R. tortuosum* (cf. p. 5) whilst the other plant has threads of 20–24 μ dia. and must therefore be regarded as *R. implexum*.

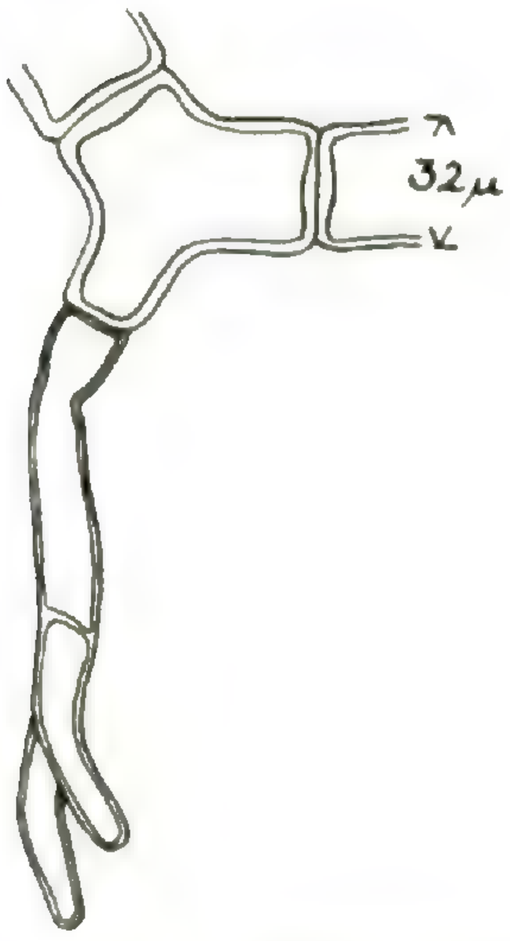


FIG. 1. Septate Rhizoid on plant of RHIZOCLONIUM IMPLEXUM from Nova Scotia.

B. MARSH FORMS OF FUCUS SPIRALIS AND FUCUS VESICULOSUS

During a study of the algal flora of some New England salt marshes two marsh fucoids were collected which at first sight appeared to be similar but which, on closer inspection, exhibited certain differences. There appear to be only two principal records of marsh fuci in earlier literature. Farlow (1881) gives a poor description of a marsh form which has short fronds and is spirally twisted. This is named *Fucus vesiculosus* var. *spiralis*, and was distributed under this name in Phyc. Bor. Amer. by Holden. It cannot be known whether Farlow was describing a new form or whether he really believed it to be synonymous with *Fucus vesiculosus* var. *spiralis* (L.) Ag. This latter, however, has been shewn by Börgesen[1] to be identical with *Fucus spiralis* L. and *Fucus Areschougii* Kjellm. It is equally clear that the plant

[1] Journ. Linn. Soc. Bot. Vol. 39. 1909.

Farlow described was not *Fucus spiralis* L. and therefore it must be concluded that Farlow's nomenclature is erroneous. I have examined the plant distributed by Holden in Phyc. Bor. Amer. and agree with Sauvageau that it approaches nearest to *Fucus spiralis* var. *lutarius*. Taylor (1937)[1] retains it under the same name that Farlow employed but refers it tentatively to v. *volubilis* (Hudson) Turner.

In 1915 Johnson and York described a marsh fucoid from Cold Spring Harbor, Long Island, which they also named *Fucus vesiculosus* var. *spiralis*. They based this determination on the claim that they could get a complete series ranging from the attached plants of *Fucus vesiculosus* var. *spiralis* (*F. spiralis* L.). On the other hand they describe it as occasionally having vesicles, whereas the usual descriptions of *Fucus spiralis* L. (Newton, 1931) indicate that normal vesicles are entirely absent. The presence of vesicles suggests, therefore, that Johnson and York's plant was not derived from *F. spiralis* L. but from *F. vesiculosus*.

A number of marsh fucoids are known which are supposed to be derived from *Fucus vesiculosus*. Two marsh forms, *F. spiralis* var. *nana* Kjellm. and *F. spiralis* var. *lutarius* (Kütz.) Sauv., have been described and are said to be derived from *F. spiralis* L. Sauvageau (1908) remarks that he examined a specimen sent from America and he considered it to be var. *lutarius* and derived from *F. spiralis* L. In 1936 I collected plants from salt marshes at Scituate, Mass. in the *Spartina alterniflora* zone which have been compared very carefully with specimens distributed by Sauvageau,[2] and there seems little doubt that these plants are referable to *F. spiralis* var. *lutarius*. The fronds are normally much narrower than any of the large marsh forms of *Fucus vesiculosus* and there is a complete absence of vesicles. They agree fairly well with Kützing's (1860) figure of *F. lutarius*.

In the winter of 1935 I collected marsh fucoids from Cold Spring Harbor, Long Island, and here I found plants which were broader than those from Scituate and which possessed vesicles, and in one place intergrades could be found up to the normal plants of *Fucus vesiculosus* which is also present in the area. So far as can be seen, these plants do not differ in any way from the forms described by Baker and Blandford (1912) and named by them *Fucus vesiculosus*

[1] Mar. Alg. N. E. Coast N. Amer. Mich. Univ. 1937. p. 206.

[2] My thanks are due to Mr. Tandy for giving me access to these plants in the British Museum.

megecad *limicola* ecad *volubilis*. They also stated that the American form is no different from the British.

It now seems clear that there are two distinct marsh fucoids to be found on the coast of New England. Both have been described by earlier authors who have unfortunately misnamed them. A clear statement on the two forms and their synonyms is presented below.

Fucus vesiculosus megecad limicola ecad volubilis Baker.[1] "*Fucus vesiculosus* var. *spiralis*" auct. *non* Farlow. Johnson and York, 1915. Carn. Publ. 212; Collins, Rhodora, 1905. vol. vii; Taylor, Mar. Alg. N. E. Coast N. Amer. Mich. Univ. 1937. Pl. 25–45.

Fucus spiralis maritima minor Hudson, Flor. Angl. 1778. p. 577. [*Fucus volubilis*] Baker, S. M. *Journ. Linn. Soc. Bot.* 1912. vol. 40, p. 289. *Fucus vesiculosus* var. *volubilis* Turner, Syn. Brit. Fuci. vol. 1, 1802. *Fucus spiralis* var. *volubilis* Batters, *Journ. Bot.* vol. 40, 1902. *Fucus axillaris* var. *spiralis* J. G. Ag. Bid. Spets. Alg. in *Kong. Svensk. Vet. Akad. Handl.* vol. vii, 1868. *Fucus vesiculosus* megecad *limicola* ecad *volubilis*. Baker and Blandford, *Journ. Linn. Soc. Bot.* 1915, p. 352. Collected from marshes in Cold Spring Harbor, L. I.

Fucus spiralis var. lutarius (Kütz.) Sauv. "*Fucus vesiculosus* var. *spiralis*" Farlow, Mar. Alg. N. England, 1881, p. 101. *Fucus lutarius* Kütz. Tab. Phyc. Vol. X. 1860, p. 7 and tab. 17. *Fucus spiralis* var. *lutarius* Sauv. *Bull. Bord. Soc. Scien. d'Arcachon*. 1908, pp. 106–160, figs. 16–19.

Probably generally distributed along the marsh coast of New England and confined to low marsh dominated by *Spartina alterniflora*.

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PLANTS OF CENTRAL PENNSYLVANIA

Robert T. Clausen and Herbert A. Wahl

The basis for these notes is a trip made by us in early June, 1937, in some of the counties of central Pennsylvania. Report is also included concerning several other collections made in the summer of the same year. In the citation of specimens, our names are abbreviated as: *C*, R. T. Clausen, and *W*, H. A. Wahl. Specimens are deposited in the herbaria of the Bailey Hortorium and the Department of Botany at Cornell University, also in the herbarium of the Pennsylvania State College.

[1] " " = misidentification

Isoetes Dodgei A. A. Eaton (*I. riparia* var. *canadensis* Engelm.). Wipples Dam, 10 miles south of State College, Huntingdon Co., Aug. 20, 1937, *W* 274.

This is apparently the first record for central Pennsylvania. The specimens possess megaspores with jagged crests and leaves to 30 cm. long.

Isoetes Engelmanni A. Br. On muddy shore of stream, Ingleby, Centre Co., June 6, *C* & *W* 2535; partially and entirely submerged at edge of pond at Wipples Dam, 10 miles south of State College, Huntingdon Co., Aug. 20, 1937, *W* 273.

Leaves of these plants attain a length of 30 cm. Central Pennsylvania records seem lacking.

Asplenium Ruta-muraria ssp. **cryptolepis** (Fernald), n. comb. *A. cryptolepis* Fernald, Rhodora **30**: 41. 1928. Frequent on limestone rocks on west side of Spring Creek, Rock, north of Lemont, Centre Co., June 5, *C* & *W* 2526.

Review of the evidence presented by Fernald (1928) and of suites of American and European specimens lead to the conclusion that the Old and New World populations of the Rue Spleenwort are very closely related and should not be specifically segregated, since the characters upon which this separation is based seem not fundamental, nor can they be rigidly applied. That the American plant is rare, as stated by Fernald, is by no means borne out by field experience in northwestern New Jersey and parts of Pennsylvania, where it could only be rated as common. Some European specimens have the stipes mostly naked, as is usually the condition in American material. Although well developed European plants, particularly from the southern part of the range, are larger than American plants, most are small and of similar size. In our specimens, the stipes measure 1.0–6.0 cm. long and the fronds, 1.5–3.0 cm., with the segments 4–12, coming well within Professor Fernald's measurements for American plants, but some European specimens almost exactly reseumble these. Further, the teeth of our specimens are coarse, but bordered by a cartilaginous rim, as is supposed to be the condition only in Old World specimens. Examination of spores of the two supposed species reveals that, as Prof. Fernald has indicated, there is no difference in size, though there is a difference in the nature of the architecture of the spore-coat. In the European plants, the spores are considerably rough, almost jagged, while in the American plants, they are less coarsely roughened, but this tendency seems not of great systematic value. Since the

separation of the two populations must depend finally upon the scales of the rootstock and a tendency in size, it seems best to treat groups thus closely related, but geographically isolated and slightly differentiated, as subspecies.

DRYOPTERIS PHEGOPTERIS (L.) C. Chr. Rich wooded slope at Rock View, Leolyn, Tioga Co., June 5, *C* & *W* 2518.

CYPERUS HOUGHTONII Torr. A small colony on barren shaly hillside at Ingleby, 2 miles east of Coburn, Centre Co., Sept. 11, *W*.

This seems not to have been previously reported from Pennsylvania.

CAREX PRAIREA Dewey. Decidedly cespitose, forming large tussocks in rich alluvial boggy meadow, Centre Furnace, about 1 mile east of State College, Centre Co., June 7, *C* & *W* 2448.

Pennsylvania records seem significant, since the state is in the southern part of the range of this species as given by Mackenzie (1931–35).

CAREX INTERIOR L. H. Bailey. Frequent in rich alluvial boggy meadow, Centre Furnace, about 1 mile east of State College, Centre Co., June 7, *C* & *W* 2557.

These plants appear typical, with ovate orbicular perigynia with short beaks. Like *C. prairea*, with which it occurs in association here, this species seems to reach its southern limits in Pennsylvania.[1]

CAREX ANGUSTIOR Mackenzie, var. **gracilenta** var. nov., spicis disjunctis et foliis gracillimis et angustissimis, 0.2–1.0 mm. latis. TYPE in Gray Herbarium, COTYPES at Bailey Hortorium and in herbaria of Cornell University and R. T. Clausen; moist woodland along stream at Ingleby, 2 mi. east of Coburn, Centre Co., June 6, *C* & *W* 2532. Besides the type, there may also be cited a collection (*W*) from 10 miles west of State College.

This differs from the typical variety of the species in the more lax and flexuous habit; in the longer inflorescence, 1.5–2.5 cm., with the 2–3 spikes rather remote; and in the very narrow leaves, which are from 0.2–1.0 mm. wide. Intermediate between this variety and typical *C. angustior* are specimens from a moist meadow 2 miles west of Richford, Tioga Co., N. Y., July 4, 1937, *C* & *S. J. Smith* 2631. These plants have the inflorescence 1.5–2 cm. long, with the spikes subremote. In the narrowness of the leaves and the slender habit, the collection of *E. Faxon*, no. 9, from Mt. Pleasant, N. H., resembles var. *gracilenta*, but it differs in having the spikes contiguous.

[1] Now reported by Core (Proc. W. Va. Acad. Sci. **11**: 36. 1938) from near Huntington, Cabell Co., West Virginia.

Carex Geyeri Boott. By limestone outcroppings, in dry deciduous woods on bluffs and slopes on west side of Spring Creek near west boundary of grounds of State Penitentiary, Rock, north of Lemont, Centre Co., June 5, *C* & *W* 2524.

Carex Geyeri grows on the bluffs along the west side of Spring Creek associated with *Asplenium Ruta-muraria* ssp. *cryptolepis*, *Carex oligocarpa*, and *Senecio obovatus*, in the shade of *Ostrya virginiana*, *Ulmus fulva*, and *Acer saccharum*. It was first discovered at this station in May, 1932, and has been under observation since that time. The possibility that this might represent an eastern representative of the section *Firmiculmes*, perhaps specifically distinct from *C. Geyeri*, has been considered, but all efforts to find satisfactory characters have failed. It was first thought that the Pennsylvania plants were more slender, with narrower leaves and slightly smaller perigynia, but large series of *C. Geyeri* from western North America indicate that the species there varies somewhat in habit and that the eastern plants come well within this range of variation. Although the habitat in Centre County seems natural and undisturbed, yet one may wonder whether the species is truly native there or has been introduced through the agency of man. We have no evidence to explain this unusual occurrence.

Carex Woodii Dewey. Rich wooded slope by Woodward Cave Woodward, Centre Co., June 6, *C* & *W* 2542.

This is reported only from the western part of Pennsylvania by Mackenzie (1931–35).

Carex laxiculmis var. copulata (Bailey) Fernald. Rich wooded slope by Woodward Cave, Woodward, Centre Co., June 6, *C* & *W* 2543; also rich woods, Rock View, Leolyn, Tioga Co., June 5, *C* & *W* 2512.

Instead of representing an extreme of *C. laxiculmis*, these collections seem more nearly intermediate between *C. digitalis* and *C. laxiculmis*, with the perigynia small, 2.6–2.8 mm. long, with staminate flowers borne at the bases of the fertile spikes, and with the leaves from 4–7 mm. wide.

Carex lasiocarpa ssp. **lanuginosa** (Michx.), n. comb. (*C. lanuginosa* Michx., Fl. bor. am. **2**: 175. 1803. *C. lasiocarpa* var. *lanuginosa* (Michx.) Kükenth in Engler, Das Pflanzenreich. **4**(20): 748. 1909.) Specimens with the leaves 1.5–3.5 mm. wide and the lowest pistillate spikes slightly peduncled, from rich alluvial boggy meadow, Centre Furnace, about 1 mile east of State College, Centre Co., June 7, *C* & *W* 2560.

Mackenzie and most other recent American students have maintained as species, *Carex lasiocarpa* and *C. lanuginosa*, basing this segregation largely on leaf-width, but also upon whether or not the lowest pistillate spike is peduncled, as well as on the condition of the beak of the achene. Certain intermediate specimens, as the collection of J. L. Edwards on June 27, 1936, from Succasunna, Morris County, New Jersey, led to a review of the material passing under the two names in the herbaria of Cornell University.

The Edwards plants were received as *C. lasiocarpa* and the extremes did represent that species, but the series revealed variations in leaf-width from the involute-filiform condition to flat and 2 mm. wide, and from having the lowest pistillate spike sessile or essentially so to possessing a stalk 2 mm. long. Examination of the available general series demonstrated that *C. lasiocarpa* ssp. *typica* definitely varies towards ssp. *lanuginosa*, while plants which have been passing as *C. lanuginosa* may be divided into two lots on a basis of leaf-width. The narrow-leaved phase (leaves 0.5–3 mm. wide), which seems intermediate between the broad-leaved form (leaves 2–4 mm. wide) and typical *C. lasiocarpa* (leaves 0.5–1.5(–2) mm. wide), seems to occur largely or almost entirely, in the area where the two so-called species overlap. South of this area, apparently only broad-leaved plants of *C. lanuginosa* occur, while north of it, and in northern Europe and Asia, typical *C. lasiocarpa* seems to be the only form represented.

Besides the leaf-character mentioned above, Victorin (1935) has employed the shape of the scale as basis for separation. He states that it is acuminate and aristate in *C. lanuginosa*, while it is acute or shortly aristate in *C. lasiocarpa*. In material, which on basis of width of leaf should be referred to *C. lanuginosa*, we found variation in the apex of the scale from acute to long-aristate, while in typical *C. lasiocarpa* we found the same range of variation. It has been stated by Robinson and Fernald (1908) that *C. lanuginosa* usually has the lowest spike peduncled, while all the spikes are sessile in *C. lasiocarpa*, but we have found specimens of the latter with the lowest spikes varying from sessile to possessing peduncles 2 cm. long, while specimens of the former may have the lowest spikes sessile or with peduncles from 1–50 mm. long. Other characters, such as length of lowest bract, employed by Mackenzie (1931–35), appear equally unsatisfactory.

Since few specimens from New York or New England are of the extreme broad-leaved form of ssp. *lanuginosa*, but many are inter-

mediate in character, they must be identified in a rather arbitrary fashion, because they appear slightly more one way than another. In the light of such a situation and in the absence of other good characters, it seems best to treat the broad-leaved race, which in North America is more southern and western than ssp. *typica*, as a subspecies of the collective species, *C. lasiocarpa*. The name of Michaux is employed for the broad-leaved race, despite the fact that the type is from the extreme northern limits of the range of this subspecies.

Carex Schweinitzii Dewey. Alluvial boggy meadow, Centre Furnace, about 1 mile east of State College, Centre Co., June 7, *C* & *W* 2559.

The pistillate spikes are 3–7 cm. long, with the lower perigynia rather remote and abortive. The staminate spikes often bear secondary spikes, sometimes with one pistillate flower at base, while the pistillate spikes are sometimes staminate at the apex. The variation in this material suggests the sort of instability that one might expect to find in a hybrid population. Besides the above collection, *C. Schweinitzii* has been reported elsewhere in Pennsylvania from Monroe and Susquehanna Counties by Porter (1903) and from Presque Isle, Erie County, by Bright (1925–30), but apparently no specimens from the state were available to Mackenzie.

Carex Frankii Kunth. Edge of woods in shaly soil beside path, Woodward Cave, Woodward, Centre Co., July 17, *W*.

Bright (1925–30) reports this species as being locally abundant in some southwestern counties. This station in Centre County is probably due to accidental introduction by tourists visiting Woodward Cave.

Amelanchier humilis Wiegand. Oak barrens southwest of State College, Centre Co., June 6, *C* & *W* 2552.

Phlox ovata L. Oak barrens 10 miles southwest of State College, Centre Co., June 6, *C* & *W* 2551.

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ON CERTAIN PLANT RECORDS FROM HILLSBORO, NEW HAMPSHIRE

C. A. WEATHERBY AND S. F. BLAKE

Since Mr. A. A. Beetle's recently published list of the vascular flora of the Fox Forest, Hillsboro, New Hampshire,[1] contains several reports of species not otherwise known from the region, it has seemed desirable to examine the specimens in the herbarium of the Forest on which, according to Beetle's preface, his records are based. Through the courtesy of the Director, Dr. Henry I. Baldwin, we have been able to make such an examination. Checking the herbarium against the published list discloses a considerable number of misidentifications. It seems unnecessary to publish a full list of these in RHODORA, since in the great majority of cases the species concerned are unquestionably present or likely to occur in the Fox Forest or its vicinity, although the specimens on which their presence in the list depends are wrongly named. In the interest of accurate phytogeography, however, some of the reports should be corrected, particularly those of calcicolous species not to be expected in the hill country of southern New Hampshire. The list of such errors follows. Author citations are given only for names not in current manuals.

Cystopteris bulbifera. Not known in southern New Hampshire. The Fox specimen is *Dennstaedtia punctilobula.*

Selaginella apoda. This might occur at Hillsboro, but the specimen is a moss.

Triodia flava (L.) Smyth. Known in southern New Hampshire only from the Merrimac valley. Specimens are a mixture of *Agrostis alba* and *A. tenuis.*

Carex diandra. Known in New Hampshire only in Coös County. Specimen is young *C. stipata.* Mr. Beetle himself made this correction on a duplicate sheet in the herbarium of the New England Botanical Club, but apparently too late to get it into the list.

[1] Beetle, A. A. Flowering Plants and Ferns of the Fox Research Forest, Hillsboro, New Hampshire. Caroline A. Fox Research and Demonstration Forest, Bull. no. 9. 40 pp. Concord, N. H., 1938.

Carex triceps, var. *hirsuta*. Not known from New Hampshire. Specimen is *C. virescens*, var. *Swanii*.

Eleocharis intermedia. Known in New Hampshire only at a single station in Coös County. Specimen is *E. obtusa*.

Juncus Dudleyi. Known in New Hampshire only in calcareous areas in Coös County and at Bath and Sumner's Falls in the Connecticut valley. Specimen is *J. macer* S. F. Gray (*J. tenuis* of manuals).

Oxalis corniculata (*O. repens* Thunb.). This record has apparently resulted from an unsuccessful attempt to correct the erroneous nomenclature of Gray's Manual, seventh edition. The specimen was originally, and correctly, identified as *O. corniculata* of the Manual (= *O. europaea* Jord., which is also given in Beetle's list). But the addition of the synonym *O. repens* Thunb. transfers the record to true *O. corniculata*, a southern species known in New England only as a weed in greenhouses and an occasional and temporary escape outside.

Euphorbia humistrata. Known in New England only from reports of its occurrence at St. Johnsbury and Woodstock, Vermont. No specimen was found. The species might, of course, have been introduced at Hillsboro; more probably the report rests on *E. maculata*, which is not included in Beetle's list.

Viola striata. Not known from New England; as pointed out in Conn. Geol. and Nat. Hist. Surv. Bull. xiv. 427, the report from Connecticut in Bishop's Catalogue is founded on highly dubious data. The Fox specimen is *V. conspersa*.

Lonicera oblongifolia. Apparently does not occur in New Hampshire. Specimen is × *L. bella* Zabel, a rather frequent escape from cultivation.

On the other hand, the list and the herbarium contain the following authentic records of considerable local interest.

Arisaema Dracontium. The specimen, collected in Hillsboro, June, 1935, by H. I. Baldwin, constitutes the first record for the species known to us east of the Connecticut valley.

Pycnanthemum incanum. Not in the list, but in the herbarium is a specimen, originally identified as *Mentha arvensis* var. *canadensis*, labelled "infrequent in shady clearings, Fox Forest, Aug., 1936. Coll. A. A. Beetle." There is no material of the species from New Hampshire either in the Gray Herbarium or that of the New England Botanical Club. Jesup (Cat. Fl. Pl. Hanover 32 (1891)) reports a single collection of it from Claremont and F. W. Batchelder (Proc. Manchester Inst. iv. pt. 2, 39 (1909)) states that it is "common" about Manchester—a change from the "not common" of his first edition hardly justified by the experience of later collectors in the region. In any case, the species is not common in the hill country and its occurrence at Hillsboro is worth mention.

Ampelopsis brevipedunculata Koehne, var. *Maximowiczii* (Regel) Rehder. If really spontaneous, the occurrence of this east-Asiatic

plant at Hillsboro is worthy of record. It is not in the list; the herbarium label refers to it as a "common roadside vine." We fear, however, that this statement refers rather to *Vitis Labrusca*, as which the specimen was determined, than to the *Ampelopsis*.

Senecio obovatus. We know of no previous record of this species from New Hampshire, though there are isolated stations for it in northeastern Massachusetts and in southeastern Vermont.

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NOTES ON SOME PLANTS COLLECTED IN THE CANADIAN EASTERN ARCTIC BY DR. POTTER IN 1937

Nicholas Polunin

From Dr. David Potter, Professor of Botany in Clark University, Worcester, Massachusetts, there recently came to me at the British Museum a parcel of vascular plants which he had collected in northernmost Labrador and southeastern Baffin Island during the MacMillan Expedition of 1937. Special attention had, at my request, been paid to certain of the "critical" groups, as well as to the collection of all available material of insignificant or ecologically restricted species. Moreover the expedition, although only a short "summer" one, visited some areas which have been little investigated botanically; while, finally, Dr. Potter had the great advantage of considerable previous experience in the North. Hence I had keen expectations with regard to his collection, especially in view of my forthcoming detailed flora of the Canadian Eastern Arctic, in whose southeastern corner all the plants which were sent to me had been gathered.

Nor was I at all disappointed; the specimens were numerous, widely representative and beautifully preserved, although unnamed. Even the very fact that the collection did not contain anything particularly startling or entirely new is gratifying, for it suggests that we have now at last a very fair general knowledge of the pteridophyte and spermatophyte flora of the region.

However, the following additions were made to the known flora—in two cases of the entire Canadian Eastern Arctic, in several other cases of Baffin Island and the rest of the Canadian Arctic Archipelago, and in the remaining instances of one or the other of the two major

districts (Northern Labrador and Southern Baffin) which were visited.[1]

DESCHAMPSIA ALPINA (L.) Roem. & Schult. S. BAFFIN: *Resolution Island* Acadia Harbour, nr. 8338. N. LABRADOR: Lady Job Harbour, nr. 8339; also Bowdoin Harbour, nr. 8347.

New to Baffin Island and to the entire Arctic Archipelago, the report from Akpatok Island[2] being founded on specimens belonging instead to the non-viviparous *D. caespitosa* series, I find on examining the material myself! *D. alpina* is predominantly a species of Europe, where it extends from Spitsbergen southwards, but it is also of rather general occurrence in southern Greenland. Elsewhere in America it is known only from this Resolution Island station and from northern Labrador, where it is almost confined to the Atlantic coast. Hence it would appear to afford a particularly good example of a species which is long established and widespread in Europe but has only just reached the nearest part of continental North America via Greenland.

DESCHAMPSIA CAESPITOSA (L.) P. de Beauv. S. BAFFIN: *Frobisher Bay* Point Brewster, nr. 8320 in part, mixed with *Poa arctica* R. Br.

New to S. Baffin, although in Herb. Kew I have seen specimens collected in the central portions of this great island as long ago as 1860 and variously labelled "*Hierochloe pauciflora*," "*Poa laxa*," "*Dupontia*," etc. The species is also known from the south shore of Hudson Strait, where it occurs on Akpatok Island (see above) and in northern Labrador and Quebec. This material from the Canadian Eastern Arctic, while it appears all to belong to the great polymorphic circumboreal *D. caespitosa* series rather than to one of the recently proposed "western" segregates, *D. beringensis* Hultén or *D. Mackenziana* Raup, nevertheless varies considerably in such characters as the length of the spikelets. However, all specimens that I have seen fall within the limits of one variety as outlined by Professor Fernald,[3] viz. var. LITTORALIS (Reut.) Richter, Pl. Eur. I, p. 56, 1890.

PUCCINELLIA VAHLIANA (Liebm.) Scribner & Merrill. S. BAFFIN: *Resolution Island* Acadia Harbour, nr. 8335.

[1] In these notes I have in general mentioned only those finds of Dr. Potter's which are real additions to the known flora, counting recent but unpublished discoveries as "knowledge" since they will shortly be dealt with in my detailed Flora of the Canadian Eastern Arctic. In four instances, however, it has seemed desirable to report the further range-extensions discovered by Dr. Potter in 1937 of plants already found elsewhere in Southern Baffin by the Canadian expedition of the previous year.

[2] By Polunin in *Journal of Botany* LXXII, p. 203, 1934.

[3] In RHODORA XXVIII, p. 153, 1926.

New to S. Baffin, although well known in N. Baffin and occurring plentifully still farther north on Devon and Ellesmere Islands. In the South it is largely if not entirely confined to calcareous areas, being common on Akpatok Island in Ungava Bay and Southampton Island in Hudson Bay. I also found it recently at Port Burwell in the extreme north of Labrador, growing on glacial till containing fragments of transported limestone. This, judging from Dr. Potter's general account (*in lit.*), would seem to have been its habitat at Acadia Harbour; for, unlike most other members of the genus, *P. Vahliana* is not at all a strand plant, being often found far inland and at high altitudes.

Carex microglochin Wahlenb. S. Baffin: *Frobisher Bay* Point Brewster, nr. 8293.

New to Baffin Island and the entire Arctic Archipelago. Previously collected in the Canadian Eastern Arctic proper, i.e. north of the 60th parallel, only at Chesterfield on the west coast of Hudson Bay (Keewatin) by me in 1936, at Ranken Inlet a little to the south of this by Macoun in 1910, and at Cape Smith on the east coast of Hudson Bay (Quebec) by me in 1936. Elsewhere very widespread in boreal regions but scarcely an arctic species, although reaching Cape Giesecke, 74° 30′ N. in East Greenland.[1]

Arenaria rubella (Wahlenb.) Sm., Engl. Bot. Suppl. I, t. 2638, 1831.

f. **epilis** (Fernald), n. comb. *Arenaria verna* L. var. *propinqua* (Richardson) Fernald f. *epilis* Fernald in Rhodora VIII, p. 32, 1906. S. Baffin: *Resolution Island* Acadia Harbour, nr. 8238.

The widespread arctic *Arenaria* (§ *Minuartia*) *rubella* is now by almost all authors maintained as a species separate from *A. verna* L.—a policy which I fully support. Hence it is necessary to make the above new combination for the glabrous phase which has not previously been recorded from the Canadian Eastern Arctic where it may, however, have been extensively overlooked.

Coptis groenlandica (Oeder) Fernald. S. Baffin: *Frobisher Bay* Point Brewster, nr. 8197.

The genus is new to Baffin and the Arctic Archipelago; also to the Canadian Eastern Arctic since it has not previously been found even as far north as the 60th parallel in Labrador, although extending much farther north in West Greenland.

[1] Cf. Gelting in *Meddelelser om Grønland* CI, 2, p. 165, 1934.

Draba crassifolia Graham. S. Baffin: *Frobisher Bay* Point Brewster, nr. 8257. N. Labrador: Lady Job Harbour, nr. 8245.

Not previously recorded from Baffin or any other part of the Arctic Archipelago but already found at Lake Harbour on the south coast of Baffin by me in 1936. North American, transgressing into northwestern Europe. Chiefly subarctic and alpine but reaching Lervig, 74° 11′ N. in East Greenland.[1] Well known in Labrador[2] and recently found at Wakeham Bay in northernmost Quebec (Polunin, 1936 field notes).

Potentilla Egedii Wormskj. in Fl. Dan. IX, t. 1578, 1818. S. Baffin: *Frobisher Bay* Point Brewster, nr. 8349.

Not previously recorded from Baffin or any other part of the Arctic Archipelago but already found at Lake Harbour on the south coast of Baffin by me in 1936. North American, transgressing into eastern Asia. Well known from the mainland regions of Labrador, Quebec and Keewatin even north of the 60th parallel, and thus widespread in the southernmost portions of the Canadian Eastern Arctic area. At Port Burwell in the extreme north of Labrador much of the material closely approaches the usual southern

var. **groenlandica** (Tratt.), n. comb. *Potentilla Anserina groenlandica* Tratt., Ros. Monogr. IV, p. 13, 1824; *P. Anserina* β. *grandis* Torrey & Gray; *P. pacifica* Howell; *Argentina pacifica* Rydberg.

Sibbaldia procumbens L. S. Baffin: *Frobisher Bay* Point Brewster, nr. 8046; also York Harbour, nr. 8045.

New to S. Baffin and probably to the whole of that great island—i.e. unless Taylor's report[3] of "Potentilla tridentata" from Cumberland Gulf had reference instead to *Sibbaldia*. This was unfortunately the case with my own report[4] of "*P. tridentata*" from Akpatok Island, the determinations having been made in my absence by others, and I suspect that it may also be true of Taylor's report (see my forthcoming Botany of the Canadian Eastern Arctic. Part I).

Euphrasia arctica Lange. S. Baffin: *Frobisher Bay* North of York Harbour, nr. 8029.

Previously reported from further north in Baffin[5] and also found at Lake Harbour on the south coast by me in 1936. The typical form is

[1] Cf. Gelting in *Meddelelser om Grønland* CI, 2, p. 73, 1934.
[2] Cf. Fernald in Rhodora XXXVI, p. 294, 1934.
[3] In *Trans. Bot. Soc. Edinburgh* VII, p. 327, 1863.
[4] In *Journal of Botany* LXXII, p. 204, 1934.
[5] By Taylor in *Trans. Bot. Soc. Edinburgh* VII, p. 330, 1863, sub nom. *Euphrasia officinalis*.

said by Fernald & Wiegand[1] to be "5–25 cm. high." To it belongs most of the material from south of the 60th parallel in eastern Canada and also from much further north in Greenland, both on the west coast and the east.[2] However, all the specimens that I have seen from the Canadian Eastern Arctic, including those from 6 stations in northernmost Labrador and Quebec, are so much smaller as to suggest that with further observation they may well prove to be varietally separable.

PLANTAGO JUNCOIDES Lam. var. GLAUCA (Hornem.) Fernald. S. BAFFIN: *Frobisher Bay* Point Brewster, nr. 8075.

The genus is new to Baffin, but not to the Arctic Archipelago, since it was found on Nottingham Island, Hudson Bay, by Dr. Robert Bell in 1884—as reported by Macoun,[3] although this was ignored by Simmons[4] and other subsequent writers. Bell's specimens, which I have seen in Herb. Ottawa, and Dr. Potter's, all belong to the usual reduced northern var. *glauca*. The occurrence of this in Frobisher Bay and on Nottingham Island, *i.e.* near both ends of Hudson Straits, indicates a likely migration route around seashores in modern times and, with a similar northern occurrence of *Carex Mackenziei* Krecz. (*C. norvegica* Willd., non Retz.), *C. maritima* Gunn. (*C. incurva* Lightf.), "*C. glareosa*" and *Zostera marina* L., seems to discount somewhat Dr. Potter's own "Botanical evidence for a Post-Pleistocene marine connection between Hudson Bay and the St. Lawrence basin."[5]

TARAXACUM CERATOPHORUM (Ledeb.) DC. S. BAFFIN: *Frobisher Bay* Point Brewster, nrs. 8161, 8163.

According to the limits given by Professor Fernald in his admirable revision of "Taraxacum in Eastern America,"[6] it would appear that all previous reports of this species from the Canadian Eastern Arctic should be transferred to *T. lacerum* Greene. Nor was I able to find any specimens of *T. ceratophorum* during my expeditions into these regions in 1931 and 1934, except on one occasion at Churchill on the west coast of Hudson Bay, well to the south of the 60th parallel. But

[1] In RHODORA XVII, p. 193, 1915; cf. also *Flora Danica* XVII, t. 2910, 1877.

[2] Cf. Gelting in *Meddelelser om Grønland* CI, 2, p. 155, 1934. sub nom. *Euphasia latifolia* Pursh.

[3] In his Catalogue of Canadian Plants. Part III, *Apetalae* p. 575, 1886, sub nom. *Plantago maritima*.

[4] "A Survey of the phytogeography of the Arctic American Archipelago" *Lunds Universitets Årsskrift*, 1913.

[5] Cf. Potter in RHODORA XXXIV, 1932—especially the map on p. 75.

[6] See Fernald in RHODORA XXXV, 1933.

in 1936, both at Cape Dorset in southern Baffin and Cape Smith on the east coast of Hudson Bay, I found specimens whose short leaves and much-hubbled fruits allowed me tentatively to refer them to *T. ceratophorum*, while in 1937 Dr. Potter gave special attention to the matter and found almost typical plants in Frobisher Bay.

In conclusion I wish to thank Dr. David Potter most sincerely for his great kindness in collecting and sending me this very interesting material.

HERBARIUM, DEPARTMENT OF BOTANY,
OXFORD UNIVERSITY, England.

WOLFFIA COLUMBIANA IN CONCORD, MASSACHUSETTS.—Shortly after the mid-summer flood of 1938 had subsided, I found *Wolffia columbiana* Karst. growing abundantly in warm, shallow water in the Great Meadows at Concord, Massachusetts. Material collected in August, 1938, has been filed in the herbarium of the New England Botanical Club.

A large acreage in the meadows has been dyked in order to create a series of shallow brook-fed ponds as a refuge for water-fowl. Much of the water is seepage from the Concord filter-beds. During the spring freshets, the water level is above the crest of the dykes and the entire meadows are flooded for miles in either direction. The Wolffia was abundant along one of the dykes on the leeward (easterly) side of the largest basin. The heavy rains just prior to the hurricane on Sept. 21, 1938—about 10½ inches fell in Concord between Sept. 17 and 21—again raised the river to freshet height. On Sept. 20, the dyke was awash and much of the Wolffia had floated down stream. The river continued to rise, and the plant apparently was entirely dispersed. On October 30, the water had fallen to nearly normal levels. but the Wolffia was more abundant than when first discovered!

From the best information available, this is the sixth station for this plant to be discovered in New England, and the first east of the Connecticut River. Previously, it appears to have been known only from Kent, Salisbury and Litchfield, in Connecticut, from Lake Champlain, and from Mt. Tom Station, Holyoke, Massachusetts.

Curiously enough, this is the second important range extension of rare and local members of the *Lemnaceae* to have been reported from the Sudbury-Concord River valley within the past twelve months.

Dr. Charles H. Blake reported the collection of *Wolffiella floridana* (J. D. Sm.) Thompson from Farrer's Pond, Lincoln, on August 11, 1937.—R. J. Eaton, Cambridge, Mass.

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS—V

H. K. Svenson

(*Continued from page 19*)

Series 4: Ovatae

38. E. obtusa (Willd.) Schultes [pl. 540, figs. 1, 6, 7; map 43]; Svenson, Rhodora xxxi. 214 (1929).—Noteworthy citations: Florida: in swamp, Welton Co., *Curtiss* in 1885 (NY); Tallahassee, *N. K. Berg* (NY). Texas: Uvalde, *Plank* in 1891 (NY); Houston, *Plank* in 1891 (NY). New Mexico: Las Vegas, *Plank* in 1895 (NY).

39. E. ovata (Roth) R. & S. [pl. 540, fig. 4; map 44]; Svenson, Rhodora xxxi. 211 (1929). *E. diandra* C. Wright, Bull. Torr. Club. x. 101 (1883) [pl. 540, fig. 3]; Svenson, Rhodora xxxi. 210 (1929).

Wright, apparently not knowing true *E. ovata* as represented in America, compared his plants from the sand-bars of the Connecticut River only with *E. obtusa*. In my opinion, *E. diandra* represents a form of *E. ovata* in which the bristles are rudimentary or lacking. Such a variation, usually of little significance in *Eleocharis*, is found in *E. ovata* in several river valleys. But specimens from the Hudson estuary usually have bristles, and except for the pallid spikelets are indistinguishable from typical *E. ovata*.

40. E. Engelmanni Steud. [pl. 540, fig. 2; map 45]; Svenson, Rhodora xxxi. 208 (1929).—Additional citations: West Virginia: Minnehaha Springs, Pocahontas Co., *Core* in 1931 (W Va Univ). Texas: Dallas, *Reverchon* no. 3596 (NY).

41. E. lanceolata Fernald [pl. 540, fig. 5]; Svenson, Rhodora xxxi. 207 (1929).

Series 5: Maculosae[1]

42. E. maculosa Vahl [map 25]; Svenson, Rhodora xxxi. 238 (1929). *E. Lehmanniana* Boeckl. in Engler, Bot. Jahrb. viii. 205 (1887).—Central America, West Indies and South America. Additional citations: Guatemala: Coban, 1350 m., *Tuerckheim* no. 1252 (NY). Guadaloupe: *Richard* (type, Cop); *Duss* nos. 3125 (NY), 3595 (NY). Martinique: *Duss* nos. 4137 (NY), 4522 (NY). Dominica: *F. E. Lloyd* no. 182 (NY). Ecuador: *Lehmann* no. 138 (US, cotype of *E.*

[1] For key to species see Rhodora xxxi, 224 (1929).

Lehmanniana); Galapagos Ids., *Svenson* no. 135 (B). COLOMBIA: Santa Elena, Dept. Antioquia, *Archer* no. 1226 (US). BOLIVIA: Apolo, 4800 ft., *R. S. Williams* no. 914 (NY). BRAZIL: Therezapolis, Rio de Janeiro, *L. H. Bailey* no. 1270a (NY); Campos de Jordão, São Paulo, *Bailey* no. 844 (NY); Butantan, São Paulo, *Hoehne* no. 5424 (G).

The type of *E. maculosa* in Vahl's herbarium is an elongate slender specimen, the culm dark-spotted by aquatic debris or by a fungus. *E. Schottiana* (Berlin, hb. *Nees* no. 1710) is the many-flowered phase, common in Southern Brazil, with firm appressed erose scales.

43. E. FUSCOPURPUREA (Steud.) H. Pfeiff. (MAP 20). Dwarf, perennial from a creeping rootstock; culms filiform, somewhat thickened, 2–7 cm. high: sheaths reddish-purple, whitened-membranous and lacerate at the apex: spikelets ovate, obtuse, 3–3.5 mm. long, 2 mm. wide: scales purplish-brown, obtuse, strongly convex, with greenish-white tips, the lowermost with a broad white midrib: style 2-fid.: achene[1] biconvex, 1.0 mm. long, obovate, dull purple with a rugose surface: style-base yellowish-green, conic, not subulate; bristles white, opaque, equalling the achene.—Fedde, Rep. Spec. Nov. xxviii. 19 (1930). *Isolepis fuscopurpurea* Steud. Syn. Cyp. 99 (1855). *H. univaginata* Boeckl. Cyp. Nov. i. 14 (1888), e descr. *H. hyalino vaginata* Boeckl. Allg. Bot. Zeit. 1896. 52 (1896). *H. vincentina* Philippi, Anal. Univ. Chil. xciii. 349 (1896); C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 18 (1901), with synonymy; Svenson, RHODORA xxxi. 239 (1929). *E. vincentina* var. *arcuata* (Kunze) C. B. Clarke (op. cit.) p. 19.—CHILE: Corral, Valdivia, *Philippi* no. 265 (TYPE, Paris); San Vincente, *Poeppig* (Paris, COTYPE of *E. arcuata*); Talcahuano, *Poeppig* (*C. Gay* no. 282, Paris). ARGENTINA: Rio del Valle, Catamarca, *Venturi* no. 6248 (US, B) (questionable).

E. fuscopurpurea has probably been derived from *E. maculosa*, differing in small stature and reduced style-base. The type is mixed with material of a nondescript plant of the *Dombeyana* group, from which Steudel may have described the style as 3-fid. The best representative of *E. fuscopurpurea* at Paris is *Gay* no. 282.

44. E. DEBILIS Kunth [PL. 543, FIG. 4]; Svenson, RHODORA xxxi. 240 (1929).

The TYPE of *E. debilis* at Berlin (Rio de Janeiro, 1814–15, ex reliquiis Sellowiani. *Humboldt* ded. 1836. hb. Kunth no. 3202) is an annual, much like *E. caribaea*, but having whitened, acute spikelets with thin, loose scales, the achenes becoming purplish-brown to black only when mature. *E. macra*, also from Humboldt, with perhaps a perennial rootstock, is apparently the same, except that it is slenderer and few-

[1] Described from *Gay* no. 282

flowered. Perhaps the West Indian plants listed under *E. Sintenisii* belong here.

45. E. BAHAMENSIS Boeckl.; Svenson, RHODORA xxxi. 229 (1929).

46. E. ATROPURPUREA (Retz.) Kunth; Svenson, RHODORA xxxi. 227 (1929).

47. E. CAPILLACEA Kunth [MAP 19]; Svenson, RHODORA xxxi. 234 (1929).

48. E. SELLOWIANA Kunth [MAP 21], Enum. ii. 149 (1837); C. B. Clarke, Ill. Cyp. t. xxxv. figs. 12–16 (1909); Barros, Anales Mus. Hist. Nat. Buenos Aires 437, fig. 4 (1928); Svenson, RHODORA xxxi. 234, t. 191, fig. 42 (1929); Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2a. iii. 168, fig. 16 (1932). *H. albivaginata* δ *macrostachya* Boeckl. Linnaea xxxvi. 438 (1869–70). *E. crispovaginata* Boeckl. in Engler, Bot. Jahrb. viii. 206 (1887), e descr. *E. thermalis* Rydberg, Mem. N. Y. Bot. Gard. i. 69 (1900). *E. galapagensis* Svenson, RHODORA xxxi. 233 (1929). *E. flaccida* sensu Standley, Field Mus. Publ. Bot. viii⁴. 261 (1931), in large part.—URUGUAY: Montevideo, *Herter* no. 42 (G). PARAGUAY: Villa Encarnacion, *Osten* no. 7882 (B, S); Igatimi, *Hassler* no. 5563 (G). BRAZIL: Goyaz, *Glaziou* no. 22330 (NY); Minas Geraes, *Claussen* (*M. B.* no. 1025) (NY); *Riedel* no. 929 (Cal). FRENCH GUIANA: Cayenne, *Broadway* no. 940 (G, NY). BRITISH GUIANA: Georgetown, *Hitchcock* no. 17026 (NY). BOLIVIA: Apolo, alt. 4800 ft., *R. S. Williams* no. 909 (NY). ECUADOR: Chatham I., *Stewart* no. 1079; Albemarle I., *Stewart* no. 1078 (Cal); Indefatigable Island, *J. T. Howell* no. 9257 (B, Cal). COLOMBIA: Cauca Valley, *Pittier* no. 635a (NY); Popayan, alt. 1300–2000 m., *Lehmann* no. 8428 (US). COSTA RICA: vic. Signatapegue, Dept. Comayagua, *Standley* no. 56052 (US); La Estrelle, Prov. Cartago, *Standley* no. 39362 (US); San Pedro des Monts, Prov. San José, *Standley* no. 32795 (US); vic. San Sebastian, Prov. San José, *Standley* no. 32740 (US); La Palma, alt. 1500–1700 m., *Maxon* & *Harvey* no. 7920 (NY).

A wide-spread species with coarse, usually rigid and often reflexed culms, varying from dwarfed material (*Standley* no. 56052 and the type of Boeckeler's *E. albivaginata* δ *macrostachya*) sometimes only 2 cm. high, to the elongated specimens (5 dm.) of *Broadway* no. 940. The TYPE at Berlin (Brazil: *Sellow*) has culms 10–12 cm. tall, 1.5 mm. wide; and yellowish-olive, turgid achenes 1.3 mm. long. In general, collections from Central America have been labeled *E. ocreata* or *E. Pittieri.* The latter species was described by Boeckeler as having purplish-black achenes, and is therefore to be associated with *E. flavescens*, or more probably, with *E. caribaea.*

E. Arechavaletae Boeckl. Cyp. Nov. i. 14 (1888); Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2, iii. t. xxxiii, figs. 7, 8 (1932). *E. flaccida*

var. *Arechavaletae* (Boeckl.) Osten. (l.c.), p. 167.—This plant, from the vicinity of Montevideo, is nearest to *E. Sellowiana*, with which it has also been associated by Osten. He describes it (p. 168), "20–25 cm. alta, culmis strictis erectis, 1 mm. diam. Spiculis 6–3 mm., squamis pallidis, ad latere ferrugineis. Nux obovata fusca nitida, setae albidae nuce breviores." It is probably a distinct species, but I have seen very little material for comparison.

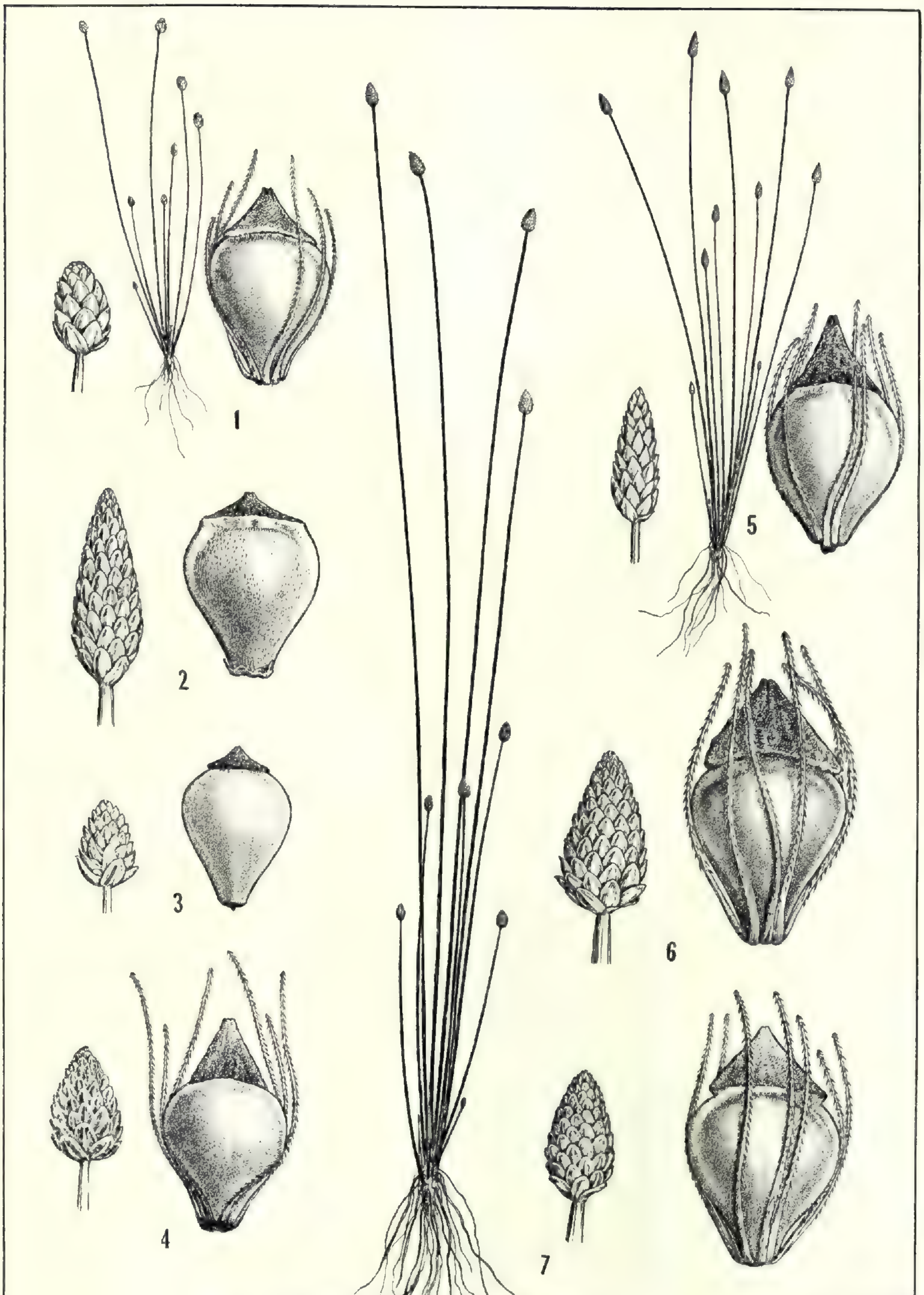
The plants from hot springs in Yellowstone Park (*E. thermalis* Rydberg) have coarse culms and large olivaceous achenes, especially in *A. Nelson* no. 6157 (NY). These, together with *Tidestrom* no. 384, Wasatch Mts., August 28, 1907 (hb. Catholic Univ.), I am placing, though with some hesitation, under *E. Sellowiana*, the species which they most closely approach.

49. E. SCHAFFNERI Boeckl. [MAP 23]; Svenson, RHODORA XXXI. 233 (1929).—Added citations: MEXICO: Jicaltepec, *Liebmann* (NY) (as *E. capitata*). HONDURAS: Copan, *Bernoulli* no. 811 (NY). GUATEMALA: between Sacapulas and Aguacatan, 6000 ft. alt., *Amy Spingarn* in 1934 (B). COSTA RICA: *Pittier* no. 548 (US) (as *E. Pittieri*).

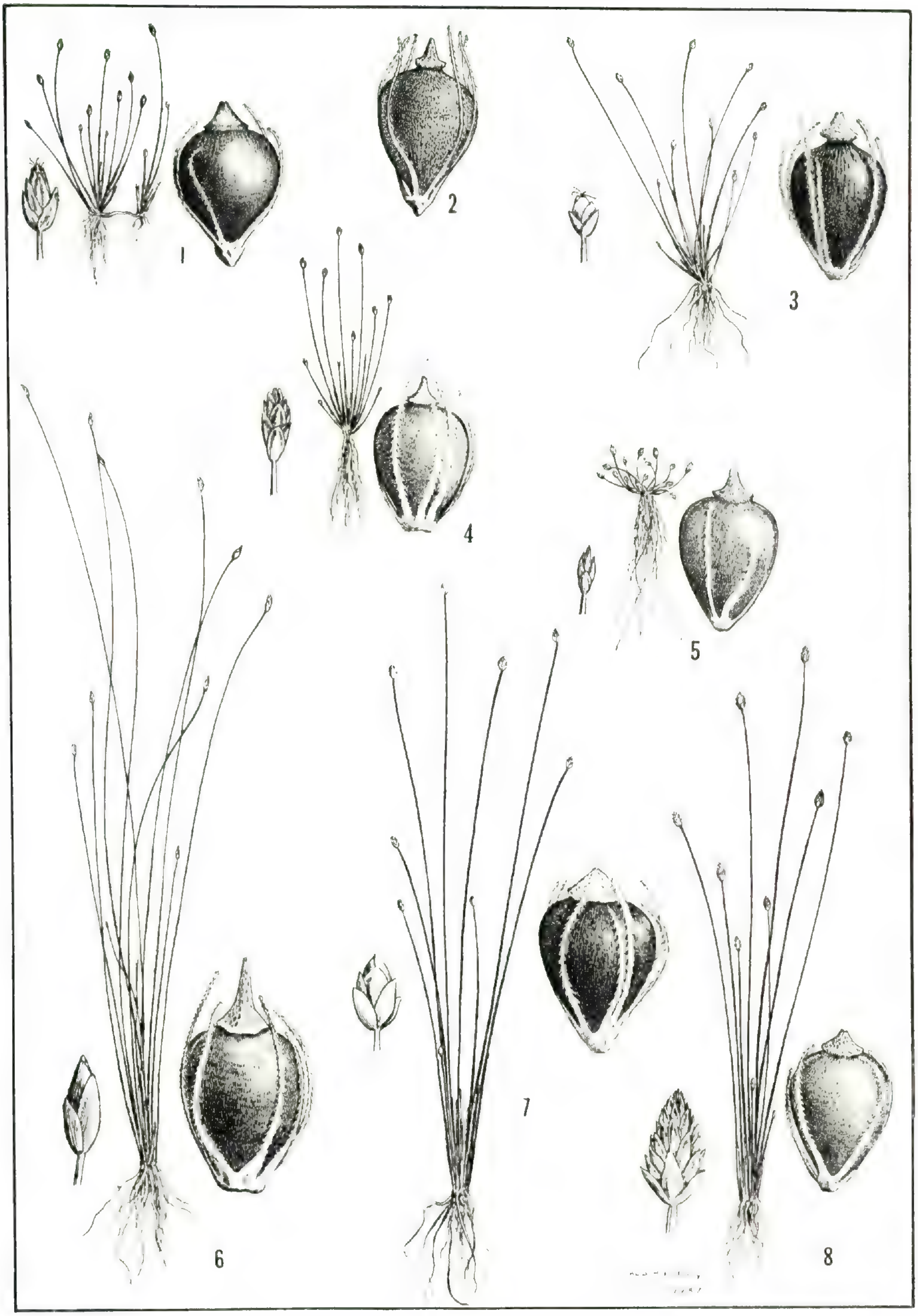
This little species is characterized by many-flowered spikelets with small divaricate scales, and striate achenes considerably smaller than those of *E. Sellowiana*.

50. E. OLIVACEA Torr. [PL. 541, FIG. 2; MAP 18]; Svenson, RHODORA XXXI. 231 (1929). *E. flaccida* (Reichenb.) Urban, var. *olivacea* (Torr.) Fernald & Griscom, RHODORA XXXVII. 155 (1935).—Additional stations of note: NEW YORK: Knickerbocker Lake, Columbia Co., *McVaugh* no. 3827 (Alb, B); brackish pond, Rensselaer Co., *Wibbe* in 1873 (NY); Dyking Pond, Rensselaer Co., *House* no. 20565 (Alb); Minerva, Essex Co., *House* no. 15458 (Alb); Newcomb, Essex Co., *House* no. 10730 (Alb); Sanford Lake, Essex Co., *House* no. 18068 (Alb); West Fort Ann and Patten's Mills, Washington Co., *Burnhham* (Alb). PENNSYLVANIA: Bristol, Bucks Co., *Driesbach* in 1924 (Carnegie). SOUTH CAROLINA: Aiken, *Ravenel* in 1866 (NY). GEORGIA: Stone Mt., *McVaugh* in 1936 (Ga.). ONTARIO: Toronto, W. Scott (Can.). MICHIGAN: Wycamp Lake, Emmett Co., *Gleason* no. 294 (B, NY); Mud Lake, Cheboygan Co., *Gates* no. 9906 (B); Austin Lake, Kalamazoo Co., *C. R. Hanes* no. 1367 (B). WISCONSIN: Long Lake, Iola, Waupaka Co., *Hotchkiss & Martin* no. 4439 (B). ILLINOIS: Wolf Lake, Chicago, *E. J. Hill* no. 218 (Ill). INDIANA: many collections by *Deam* in the northern part of the state; by *E. J. Hill* and others (Ill) from Lake County. MINNESOTA: Mink Lake, Clearwater Co., *J. B. Moyle* no. 931 (NY).

Throughout the West Indies, typical *E. flavescens* is characterized



ELEOCHARIS, series OVATAE (habit × ½, spikelets × 2½, achenes × 20). FIG. 1, E. OBTUSA var. JEJUNA. FIG. 2, E. ENGELMANNI f. DETONSA. FIG. 3, E. DIANDRA. FIG. 4, E. OVATA. FIG. 5, E. LANCEOLATA. FIG. 6, E. OBTUSA var. GIGANTEA. FIG. 7, E. OBTUSA.



Eleocharis (habit × ½, spikelets × 2½, achenes × 20). Fig. 1, E. flavescens. Fig. 2, E. olivacea. Fig. 3, E. Sintenisii. Figs. 4, 5, E. minuta. Fig. 6, E. Sintenisii (E. Shaferi). Fig. 7, E. intricata (E. madagascariensis). Fig. 8, E. minuta (E. Maidenii).

by small achenes (0.8–1.0 mm. long) which become reddish-brown before maturity and deep purplish-black when mature. *E. olivacea* has larger achenes, usually with a larger subulate style-base, and an olivaceous surface which sometimes becomes darkened, but does not show the reddish coloration of *E. flavescens*. Color of scales is of little significance, but tends to be faded in estuarine specimens. The bristle character, as in practically all other species of *Eleocharis*, is nearly worthless. Based on these characters, especially the color and size of achenes, I have yet to find undoubted *E. flavescens* north of South Carolina except for two collections: Virginia Beach, Virginia, *Hollick & Britton* in 1890 (NY) and Ogletown, Newcastle Co., Delaware, *Commons* in 1866. Although color of achenes holds well as a specific character in other members of this group, it is possible that a demonstrable transition will be found between *E. flavescens* and *E. olivacea*.

51. E. FLAVESCENS (Poir.) Urban [PL. 541, FIG. 1; MAP 22], Symb. Ant. iv. 116 (1903); Britton, Surv. Porto Rico & Virgin Ids. v. 91 (1923). *Scirpus flavescens* Poir. in Lam. Encycl. vi. 756 (1804). *Baeothryon flavescens* A. Dietrich, Sp. Pl. ii. 91 (1833). *Scirpus Gaudichaudianus* Kunth, Enum. ii. 157 (1837). *Eleogenus ocreatus* Nees vars. α *1. minor*, α *2. flaccidus* Nees in Mart. Fl. Bras. ii[1]. 102 (1842). *Scirpus bahiensis* Steud. Syn. Cyp. 83 (1855). *H. albivaginata* vars. β *flaccida*, γ *stricta*, ε *humilis* Boeckl., Linnaea xxxvi. 437, 438 (1869–70). *H. Urbani* Boeckl. Allegm. Bot. Zeit. ii. 20 (1896). *H. Dussiana* Boeckl., op. cit., p. 54; *E. flaccida* (Reich.) Urban, Symb. Ant. ii. 165 (1900); Svenson, RHODORA xxxi. 235 (1929).—West Indies, eastern South America, Mexico and eastern United States. [See also discussion under *E. olivacea*].

The TYPE of *E. flavescens* (Paris) from Porto Rico is 4–6 cm. high, with yellowed culms unusually firm and rigid, and with immature olivaceous achenes. *Scirpus bahiensis* Steud. (TYPE, Paris) from Salzmann's collection at Bahia in 1834 is apparently the same; likewise *Gardner* no. 150 (NY, US), the collection upon which *Eleogenus ocreatus* α 1. *minor* was based. *E. Dussiana* from Martinique, *Duss* no. 466a (COTYPE, NY), is an elongate form. *S. Gaudichaudianus* from Rio Janeiro (TYPE, Berlin) outwardly resembles *E. radicans*, with culms 10–15 cm. long, and small, olivaceous achenes. It has been determined as *H. albivaginata* var. *stricta* by Boeckeler. *H. Urbani* (PL. 545, FIG. 4), founded on worthless material of *Glaziou* no. 17174 (TYPE, Cop) from Rio de Janeiro, is apparently *E. flavescens*. The specimen of *E. laetevirens* Steud. Cyp. 79 (1855) at Berlin, probably a

cotype, has ocreate sheaths as in *E. flavescens* but many-flowered spikelets resembling those of *E. atropurpurea*, under which it was included by Boeckeler. The achenes are unusually small (0.7 mm. long) with a translucent brownish-olive surface, and the swollen culms are 6–12 cm. long and nearly 1 mm. wide. It may well represent a distinct species allied to *E. Schaffneri*. Weigelt's specimen of *Scirpus flaccidus* at Berlin (type) with small olivaceous achenes and the habit of "*Scirpus planifolius* Muhl.," is perhaps the same *E. lactevirens*. *E. flavescens* is not definitely known from Central America, and the only Mexican collection seen, is from Guadalajara, *Pringle* no. 3431 (NY).

E. flavescens (Poir.) Urban var. **fuscescens** (Kuekenthal), n. comb. *E. flaccida* var. *fuscescens* K. in Fedde, Rep. Spec. Nov. xxiii. 191 (1926); Svenson, Rhodora xxxi. 238 (1929). *E. praticola* Britton in Small, Fl. Se. U. S. 182 and 1327 (1903); Svenson, Rhodora xxxi. 229 (1929).

Re-examination of the type of *E. praticola* shows that it is composed of two things:

1) plants 3–4 cm. high, with weak culms and brown spikelets, sheaths marcescent at apex, achenes reddish-brown (0.75 x 0.5 mm.) with white bristles half as long.....*E. flavescens* var. *fuscescens*.
2) plants 3–4 cm. high, with rigid flattened culms, brown spikelets, red sheaths with pointed apex; achenes black (0.85 mm. long) with brown rudimentary bristles.....*E. caribaea*.

The achenes of *E. praticola* were described as "about 0.5 mm. long, dark brown" with bristles "retrorsely barbed, shorter than the achene," and this description applies only to the specimens with scarious sheaths. My description of *E. praticola* (l.c.) was based on mixed material, but the illustration (pl. 191) shows the "*flavescens*" type, both in habit and achene. *Fredholm* no. 5820 was selected as the type by Dr. Britton, and an envelope on a separate sheet has in Fredholm's writing "Plant comes near *E. capitata* R.Br., but the bristles are shorter (about 2/3) than achene which is dark brown, not jet black . . . Plant only found in shallow excavations on Kissimmee prairie." These dwarf Florida specimens are not the equivalent of Kuekenthal's Cuban plants with culms 6–10 cm. tall, which represent ordinary *E. flavescens* with brownish scales, but I do not know where to draw the line.—Cuba: Santa Clara, *Ekman* no 18369[b]. Florida: *Fredholm* no. 5820 (in part) (type of *E. praticola*, NY); *A. A. Eaton*, Dade County in 1903 (NY) and no. 837 (in part) (G);

Eva, Polk County, *Small & DeWinkeler* no. 9760 (NY). Specimens of *E. praticola* previously cited from Cuba and the Bahama Islands are here referred to *E. geniculata* (*E. caribaea*).

52. E. Sintenisii Boeckl. (pl. 541, fig. 3). map 24. *Rootstocks wide-creeping to matted-lignescent;* culms filiform, 0.5–3 dm. long, often short and rigid, irregularly sulcate; sheaths stramineous to purple, the *apex acute, not inflated:* spikelets usually few-flowered, elliptic-lanceolate to ovate, obtuse to acute; scales obtuse to subacute, stramineous to purple, often with a green midrib: stamens 2 or 3, anthers 0.4–0.7 mm. long: style 2-fid: achenes lenticular, narrowly obovoid, 0.9–1.4 mm. long, shining black; style-base conical to subulate; bristles light brown to white, equalling or exceeding the achene.—Cyp. Nov. i. 16 (1888). *E. Shaferi* Britton, Mem. Torr. Bot. Club xvi. 59 (1920) [pl. 541, fig. 6]. *E. yunquensis* Britton, Bot. Porto Rico & Virgin Ids. v. 92 (1923). *E. atropurpurea* sensu Britton (op. cit., p. 91); not (Retz.) Kunth. *E. Ekmanii* Kuekenthal in Fedde, Rep. Spec. Nov. xxiii. 192 (1926); Svenson, Rhodora xxxi. 230 (1929). *E. debilis* Kunth, forma *macra* (Kunth) Boeckl., sensu Kuekenthal (l. c.) (as to Cuban plants).—Porto Rico, Cuba, and the Florida Keys. Porto Rico: prope Bayamon ad Palo Seco in fossis, hb. *Krug. & Urban* no. 1220 (NY, cotype of *E. Sintenisii*); moist places between Bayamon and Comerio, *Britton* no. 8527; Sierra de Naguabo, *Shafer* nos. 3607 (NY), 3138 (NY); Collazo River, *Britton* no. 8671 (NY); wet savanna near Laguria, San José, *Britton* & *Britton* no. 7179 (NY); Luquillo Mts., 950 m., *Britton & Bruner* no. 7619 (NY, type of *E. yunquensis*). Cuba: Campo Florido, Havana, *Ekman* no. 19015 (NY, cotype of *E. Ekmanii*); Batabano, Havana, *Shafer* no. 231 (NY); Santa Clara City, *Ekman* no. 18846 (NY); Sierra Nipe, near Woodfred, Oriente, *Shafer* no. 3414 (NY, 2 sheets), (type of *E. Shaferi*); Sierra de Nipe, Oriente, *Ekman* no. 2146 (NY); limestone plain, Ensenada de Siguanea, *Britton* & *Wilson* no. 14892 (NY). Florida: hammocks, Big Pine Key, *Small* & *Small* no. 5081 (NY); lime sink, Big Pine Key, *Killip* no. 32079 (US, B).

Of the rhizomatous West Indian specimens with acute sheath-apex, I can make out only a single species, although a considerable amount of variation occurs in size of achenes. Those of the type of *E. Shaferi* are 1.4 mm. long, including the subulate style-base. Smaller specimens, such as the type of *E. Sintenisii*, have achenes often only 1.0 x 0.5 mm. The relatively narrow achene of material from mountainous parts of Porto Rico and Cuba broadens out in the collections from Big Pine Key to average 0.9 x 0.6 mm., but I see no distinction between the Florida plants and, for example, *Britton* no. 7179 from Porto Rico. *E. Sintenisii* is closely related to *E. maculosa* and *E. geniculata* (*E. caribaea*), and also to *E. debilis* of Brazil.

53. E. geniculata (L.) R. & S.

Through examination of specimens described in *Hortus Cliffortianus*, which are at the British Museum, J. E. Dandy adequately shows that the description of *Scirpus geniculatus* L. rests entirely upon the plant which Linnaeus actually saw, which is the species now called *E. caribaea*. The large species with septate culms, passing as *Eleocharis geniculata*, must take the name *E. elegans* (HBK) R. & S.

Some time ago Mr. Dandy sent me a letter, embodying the results of his investigation of the status of *E. capitata*. A synopsis of this report has been published by C. X. Furtado in the Gardens Bulletin, Straits Settlements ix. 293, 294, 298–299 (1937). I must therefore be content with excerpts from Mr. Dandy's letter:

"*Scirpus capitatus* belongs to *Eleocharis*, and under this genus Blake (1918) took up for it the name *E. capitata* R. Br., which he treated as a new combination having *S. capitatus* L. as basis. But here he erred, for *E. capitata* R. Br. was *not* founded on *S. capitatus* L.; Robert Brown plainly indicated as much by deliberately excluding the Clayton plant which is the holotype of *S. capitatus*. What Brown did cite under *E. capitata* was "Scirpus capitatus. *Linn. sp. pl. ed. Willd.* 1. *p.* 294. (secundum synonyma Brownii et Sloani . . .)" together with *Scirpus culmo nudo, spica terminatrice subrotunda* L. (Hort. Cliff.) . . . "In view of these facts, *E. capitata* R. Br. must be regarded as the name of a new species and not as a new combination, and the lectotype should be the plant from which Brown drew up his description, namely his own no. 5930 from Australia (in the British Museum Herbarium). This plant is conspecific with *E. caribaea*, and so also is the "Hortus Cliffortianus" plant which Brown referred to *E. capitata* and which will be further discussed below.

"Thus *Scirpus capitatus* L. and *Eleocharis capitata* R. Br. are independent species based on different types and it follows that Brown's name prevents the valid transfer of Linnaeus's epithet *capitata* to *Eleocharis*. The next earliest name for Linnaeus's species is *S. filiformis* Lam. (1791), but this is invalidated by *S. filiformis* Burm. f. (1768). The next available name is *S. tenuis* Willd. (1809), and as this is legitimate the correct name for the species under *Eleocharis* is *E. tenuis* (Willd.) Schult.

"*Scirpus geniculatus* L. was based on *Scirpus culmo nudo, spica terminatrice subrotunda* L. (Hort. Cliff.) together with *Juncus aquaticus geniculatus, capitulis equiseti, major* Sloane and *Juncus aquaticus geniculatus, capitulis equiseti, minor* Sloane. In the Linnean Herbarium there is no specimen named *S. geniculatus* by Linnaeus; there is only a specimen (from Browne) which was named *S. geniculatus* by Solander and which was not in the herbarium in 1753. This specimen has been determined by C. B. Clarke as *Eleocharis interstincta*. It has certainly no status as regards the typification of *S. geniculatus*. Apparently the only actual specimen of *S. geniculatus* which Linnaeus saw and accepted was the plant in the Hortus Siccus Cliffortianus (now at the British Museum) which he originally named *S. culmo nudo, spica terminatrice subrotunda*. His original description of *S. geniculatus*, "Scirpus culmo tereti nudo, spica subglobosa terminali," was virtually a rewording of his phrase-

name published in the "Hortus Cliffortianus," and the plant dealt with in that work should be taken as the lectotype of *S. geniculatus*. The Sloane synonyms were included solely on the evidence of Sloane's descriptions and figures; Linnaeus had not seen the actual plants, which are now preserved in the Sloane Herbarium at the British Museum.

"The "Hortus Cliffortianus" plant, which is thus the lectotype of *Scirpus geniculatus* L., has already been mentioned above in the discussion of *S. capitatus*. It is identical with *Eleocharis caribaea* and was correctly referred by Robert Brown to his *E. capitata*. This means that the names *E. caribaea* (Rottb.) Blake and *E. capitata* R. Br. become synonyms of *E. geniculata* (L.) Roem. Schult., which was based on *S. geniculatus* L., though Roemer and Schultes followed Vahl in treating the true (lectotypical) plant as var. β."

The synonymy of the true (emended) *E. geniculata* is as follows[1]:

Eleocharis geniculata (L.) Roem. & Schult. Syst. Veg. ii. 150 (1817) emend., quoad var. β. *Juncus aquaticus geniculatus, capitulis equiseti, minor* Sloane, Cat. Pl. Ins. Jam. 37 (1696); Voy. Jam. Nat. Hist. i. 122, t. 75 fig. 2 (1707). Ray, Hist. Pl. iii. 628 (1704). *Scirpus culmo nudo, spica terminatrice subrotunda* L. Hort. Cliff. 21 (1737). Royen, Fl. Leyd. Prodr. 48 (1740). *Scirpus geniculatus* L. Sp. Pl. i. 48 (1753) pro parte, excl. syn. *Juncus . . . major. Scirpus caribaeus* Rottb. Descr. Pl. Rar. Ic. Ill. 24 (1772). *Scirpus geniculatus* var. *minor* Vahl, Enum. Pl. ii. 251 (1806). *Eleocharis capitata* R. Br. Prodr. 225 (1810). *Eleocharis geniculata* var. *minor* (Vahl) Roem. & Schult. *loc. cit.* (1817). *Eleogenus capitatus* (L.) Nees ex Wight, Cat. 113, n. 1899 (1834) pro parte, excl. syn. L. *Limnochloa geniculata* (L.) Nees in Mart. Fl. Brasil. ii, 1. 99 in adnot. (1842) pro parte. *Chlorocharis capitata* (R. Br.) Rikli in Pringsh. Jahrb. Wiss. Bot. xxvii. 564 (1895). *Eleocharis caribaea* (Rottb.) Blake in Rhodora xx. 24 (1918).[2]

Revised nomenclature of the three species (and additional synonymy of *E. geniculata*) is as follows:

(1) E. geniculata (L.) R. & S.; not of recent auths. *E. setacea* R. Br. Prod. 225 (1810). ? *Scirpus caducus* Delile, Fl. Egypte 9, t. 6, fig. 2 (1813). *E. caduca* Schultes, Mant. ii. 88 (1824); Kunth, Enum. ii. 151 (1837); Steudel, Syn. Cyp. 79 (1855); Boiss. Fl. Orient. v. 388 (1884); C. B. Clarke, Journ. Bot. xxv. 268 (1887); Durand & Schinz, Consp. Fl. Afr. v. 597 (1895); Terraciano, Malpighia ii. 305 (1888); Fiori, Fl. Ital. Ill. fig. 421 (1921). *Scirpus Brownii* Spreng. Syst. i. 204 (1825). *E. riparia* Nees ex Spreng. Syst. iv.[2] 27 (1827), as synonym of *S. Brownii*. *Scirpus palmaris* Willd. ex Kunth, Enum. ii. 150 (1837), as synonym (Willd. no. 1185!). *E. microformis* Buckley; Svenson, Rhodora xxxi. 230 (1929).

(2) E. elegans (HBK) R. & S. Syst. ii. 150 (1817). *E. geniculata*

[1] Sec. J. E. Dandy.

[2] Svenson, Rhodora xxxi, 225 (1929).

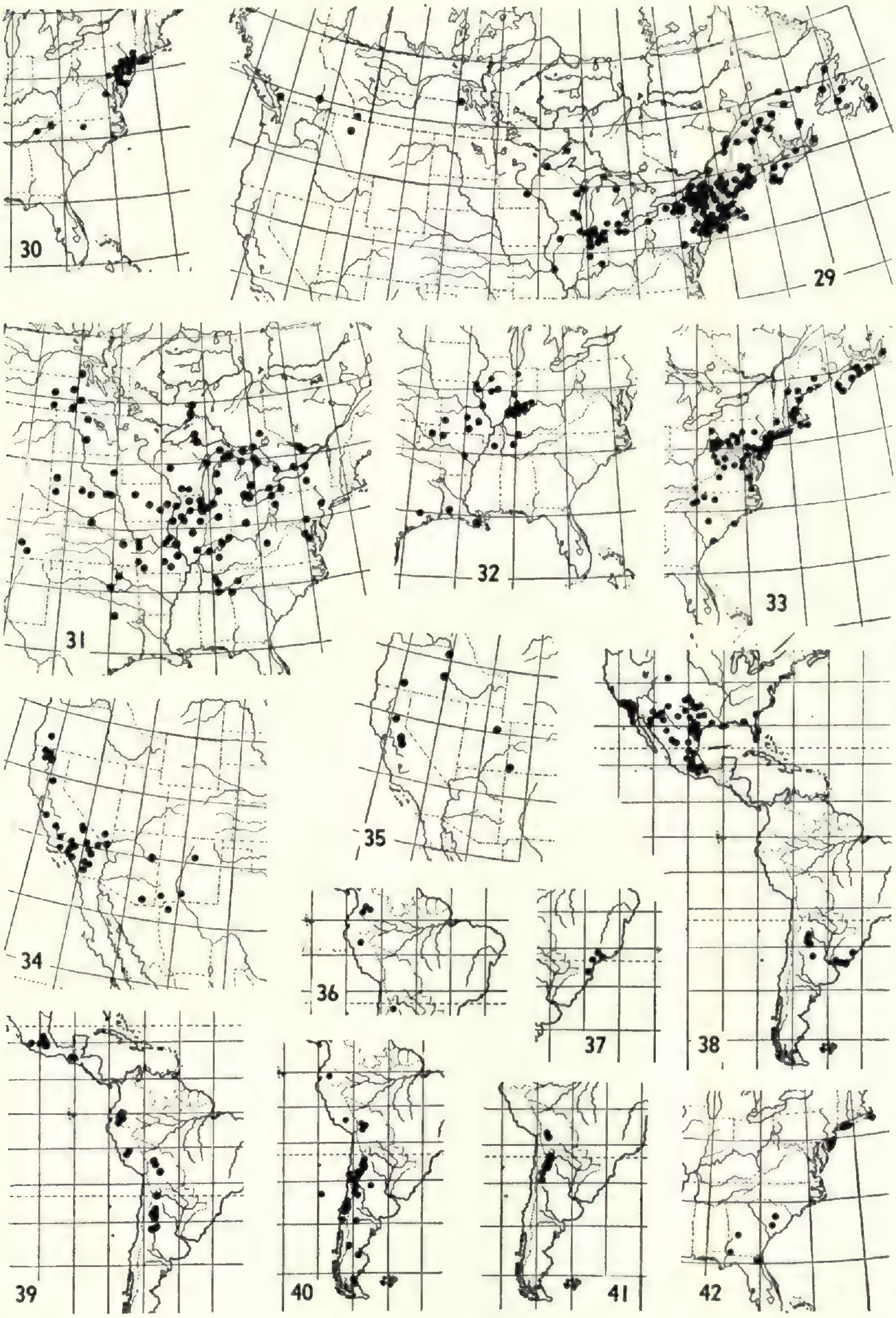
of auths.; Svenson, Rhodora xxxix. 259 (1937); not *Scirpus geniculatus* L.

The type collection of *Scirpus elegans* at Berlin (Kunth hb. 3226) bears the notation "Lima, D'Urville ded. 1835. *Scirpus geniculatus* Linn. (fide herb. Vahl). *Scirpus elegans* Humb. & Kth. ex herb. Willd. descripsit."

(3) E. tenuis (Willd.) Schultes, Mant. ii. 89 (1824); *E. capitata* (L.) R. Br. var. *typica* Svenson, Rhodora xxxiv. 199 (1932).

Stations for *E. geniculata* (*E. caribaea; E. dispar*) about the Great Lakes have been much extended through the explorations of Dr. T. M. C. Taylor and Dr. F. J. Hermann (cf. Rhodora xxxvii. 365–367 (1935)). This is the most widely-distributed species of *Eleocharis* in the world, and it would be strange if it did not appear in the interior of North America. The plant of the Great Lakes is the lax form seen at the limit of range, apparently identical with *E. setacea* of Australia. Plants with similar roseate to purple scales and purple achenes are common in the tropics (cf. *Moldenke* no. 511 (NY) and *Small* & *Carter* no. 2887 (NY)), nor does laxness of habit or even reduction of bristles have much significance. No advantage appears to be gained by maintaining var. *dispar*. Of E. J. Hill's care in describing *E. dispar* no one can doubt, but his letter to Dr. Britton (accompanying specimens) shows that he compared with his Indiana material "perennial" plants of *E. capitata*, i.e. *E. flavescens*, which comprised the true "*Scirpus capitatus* L." of Torrey's herbarium.

The type of *E. caduca* (Delile) R. & S. [Paris] from Damietta, Egypt, is a plant without stolons, with upper sheaths acute and definitely not ocreate, and with purplish-black achenes 1.2 mm. long. But Delile's plate definitely shows a plant with stolons. From Sardinia I have seen another collection of *E. caduca* (*I. Mueller* in hb. Calif. Acad.). The dwarf round-headed *E. microformis* from Texas with achenes 0.7–0.9 mm. long, often confused with *E. atropurpurea*, I now believe to be a small extreme of *E. geniculata* (*E. caribaea*), similar to specimens from Nicaragua (*Maxon, Harvey & Valentine* no. 7291 (NY)), and from Honduras (*Schipp* no. 913 and *Standley* no. 56671 (NY)). *E. caribaea* var. *Stokesii* F. B. H. Brown, Bishop Mus. Bull. 84: 106, Pl. xivB (1931), was published without being distinguished from typical material, but the variety at any rate cannot have much significance.



Maps 29–42. Map of Eleocharis: 29, elliptica; 30, tenuis var. pseudoptera; 31, compressa; 32, tenuis var. verrucosa; 33, (tenuis var. typica); 34, Parishii; 35, Bolanderi; 36, (nodulosa var. angulata); 37, subarticulata; 38, montevidensis; 39, Dombeyana; 40, albibracteata; 41, crinalis; 42, tricostata.

Ocreatae (Old World)

The Old World material has at times been placed under *E. flaccida* var. *humilis*, which is equivalent to *E. flavescens;* but it actually represents two well-defined species of variable habit, differing markedly from *E. flavescens* in the character of the achenes:

Mature achenes olivaceous, 1.0 mm. long . . . . . *E. minuta.*
Mature achenes purplish-black, 1.2–1.3 mm. long . . . . . *E. intricata.*

54. E. minuta Boeckl. (pl. 541, figs. 4, 5, 8) map 26. Culms spongy, 1–3.5 cm. long, green, decumbent or arching, closely matted, sulcate-flattened to quadrangular; sheaths membranous, but not conspicuously inflated: spikelets ovoid, 3–7-flowered: scales ovate, subacute, 1–1.5 mm. long, scarcely keeled, green, often with purple sides: stamens 3: achenes biconvex, olivaceous, obovate, 1 mm. long, 0.6 mm. wide, lightly striolate-reticulate: style-base flattened-apiculate, ¼ as wide as the achene: bristles 6–7, white, equalling the achene.—Engl. Bot. Jahrb. v. 503 (1884); Chermezon, Bull. Soc. Bot. France lxxv. 285 (1928). *E. Maidenii* Kuekenthal in Fedde, Rep. Spec. Nov. xiii. 135 (1914).—Madagascar: *Hildebrandt* no. 3527 (Cop); *Perrier de la Bâthie* nos. 2688 (B), 18484 (B); *DeCary* in 1921 (K). Uganda: King's Lake, Kampala, *Hancock & Chandler* no. 27 (K, B). Australia: Brisbane River, *Bailey* (K); Richmond River, *C. Moore* no. 159 (K) (as *E. atropurpurea*); Northgate to Nudgee, Brisbane, on wet mud, *S. T. Blake* no. 4724 (B).

Boeckeler's type or cotype (Cop) of *E. minuta* is less compact than P. de la Bâthie's no. 2688, and the subulate style-base is a trifle more prominent. These are the same as Bailey's dwarf plants from Brisbane, but the species ranges to much larger plants with culms as high as 14 cm. (cf. *Blake* no. 4724).

55. E. intricata Kuekenthal in Fedde, Rep. Spec. Nov. xiii. 135 (1914) [pl. 541, fig. 7; map 27]; Svenson, Rhodora xxxi. 239 (1929). *E. radicans* Kunth, Enum. ii. 142 (1837) (as to Mauritius plant only), not *Scirpus radicans* Poir. *Scirpus repens* Willd. ex Schult. Mant. ii. 84 (1824). *E. Chaetaria* sensu Baker, Fl. Maur. & Seychelles 420 (1877); not R. & S. *E. madagascariensis* Chermezon, Bull. Soc. Bot. France lxxv. 284 (1928).—East Africa, Madagascar and Mauritius. Africa: Kyimbila, Nyassa, 15–1600 m., *M. Stolz* no. 1132 (cotype, Ph, K); Socotra, *Balfour* no. 457 (K). Madagascar: *P. de la Bâthie* no. 16646 (B); *Blackburn* in 1863 (K, as *E. setacea*). Mauritius: *Horne* in 1876 (K, as *E. acicularis* and *E. Chaetaria*); in streams, *R. E. Vaughan* B43 (K); banks of Moka River, *P. B. Ayres* in 1861 (K); *M. Bouton* (K, as *Scirpus natans*); *H. H. Johnston* in 1888 (K).

Scirpus repens Willd. (no. 1175), based on dwarf plants collected

by Petit-Thouars in Mauritius, closely resembles *Scirpus radicans* Poir., and has immature olivaceous achenes 1.2 mm. long, the style-base being more prominent that in *E. flavescens*. *E. intricata* and *E. madagascariensis* have identical spikelets and achenes (1.2–1.3 mm. long, with prominent style-base), and differ only in habit; the latter plant having culms up to 16 cm. high and sheaths decidedly ocreate, though not as prominently as in *E. flavescens*.

Series 6: Palustriformes, Subseries: Palustres

The North American representatives of this group received an excellent and detailed treatment by Fernald & Brackett in Rhodora xxxi. 57–77 (1929). Yet the group in its wider distribution presents such baffling interrelationships and so few tenable characters that this present treatment must necessarily be provisional. In eastern United States, thanks to the above-mentioned work, the entities are clear; in Europe and in western United States, the situation seems to be chaotic. The *Palustres*, chiefly of holarctic distribution, have probably spread out in post-glacial time, achieving a variation comparable with that of *Rubus* or *Crataegus*. In Western United States, with its natural barriers and diversified terrain, numerous intergrading geographical races have developed, the most noteworthy of which I have illustrated by drawings and photographs. It would be perfectly easy to describe more species in this group, adding to the plethora of intangible species, but I have made little or no change. In my mind, there is even some question whether more than a single good species of the *Palustris* group exists in northwestern Europe, and whether in Europe there are not environmental responses to sea-strand, meadow, and bog, which parallel the variation of *E. palustris* in western America. Although I have spent an inordinate amount of time on this group and have seen a vast amount of material, the problems do not appear to be close to solution. A careful, perhaps statistical, study of the group is needed throughout Europe; then, with enlightenment as to actual lines of specific demarcation, a similar treatment of the plants of western United States should be attempted. For this I hope that I have at least built up a framework.

Comparative width of the tubercle (style-base), the uniglumate character of the spikelet, rigidity or softness of the culm, or even a mucronate sheath-apex, are characters which do not always hold in species of this group. For example, the type and associated collections

of *E. macrostachya*, which have a well-developed mucro, pass imperceptibly into plants with non-mucronate sheaths; normal *E. macrostachya* freely intergrades with uniglumate plants of the Great Plains and westward, and specimens with soft flaccid culms merge directly into those with rigid culms. One collection which Dr. Ada Hayden has sent me (no. 7010 from Clay Co., Iowa) has plants with the lower half flaccid and ribbon-like, the upper half cylindric and rigid; such structural variations probably reflect rapid change in water-level or show differences in submerged and emersed portions of the culm.

Similar intergradations appear in European plants. With hopes of solving the *E. palustris* problem, I collected specimens in Europe during the summer of 1937, whenever it was possible to do so. The largest collection consisted of homogeneous plants (PL. 542, FIG. 1) from sandy lake-shores at Ramkvilla, north of Wexiö in Sweden, growing with *Scirpus lacustris*, *Lobelia Dortmanna*, *Ranunculus reptans* and *Litorella uniflora*. These had the rigid opaque culms of typical *E. palustris*. Yet specimens (32) selected at random all had the wide tubercle (wider than high) characteristic of *E. mamillata*, and, to make matters worse, 4 of them (12½%) were definitely uniglumate. Such rigid plants with ovate spikelets and dusky divaricate scales acute and strongly hyaline at the apex, appeared to be representative of *E. palustris* in Småland, the province where Linnaeus lived. Plants with thin, semitranslucent culms (*E. mamillata*), occasional along meadow brooks, had tubercles of the same type. The achenes of *E. palustris*, though variable in size, were larger, duller, and somewhat more reticulate than is usual in plants of eastern North America; in well-developed specimens they averaged 2.6 mm. long and 1.5 mm. wide, with tubercles 0.4 mm. high and 0.43 mm. wide. This type of plant is characteristic of much of the herbarium-material of *E. palustris* from Sweden, and even with the fine lot of specimens given to me by Dr. Samuelsson, I have not reached a satisfactory basis for precise separation of *E. palustris*, *E. mamillata*, and *E. uniglumis*. Though the amplexicaule lower scale is the criterion for determination of *E. uniglumis*, the dark brown semi-glutinous scales and the subsaline habitat are equally characteristic. It was rather disconcerting to find such material [PL. 542, FIG. 2] (all but the uniglumate condition) along the seacoast near Giant's Causeway in Ireland.

In addition to Clarke's revision of the *Eleocharis* species of Europe[1]

[1] Journ. Bot. xxv. 267–271 (1887).

and the complicated treatment of the *Palustris* group by Ascherson & Graebner under *Scirpus*,[1] the European *Palustres* have been elaborated by H. Lindberg[2] and by Beauverd.[3] In the last-named treatment, the varying spiral arrangement of the scales is illustrated for several species; *E. benedicta* is described from an alpine lake in Savoy, and Dr. Lindberg's *E. mamillata* is reduced to a subspecies under *E. palustris*.

As to the type of *E. palustris*, I have examined the two sheets in the Linnaean herbarium at London. One of these is *E. multicaulis*, from which the idea that typical *E. palustris* was a small plant may have been derived. The other is *E. mamillata*, so labeled by Dr. Lindberg, of which I have a photograph through the kindness of Mr. Savage. In recent correspondence, Dr. Lindberg is of the opinion that this Linnaean specimen should not be accepted as the sole type of *Scirpus palustris*.

Scirpus glaucescens, represented by no. 1188 in the Willdenow Herbarium, belongs with *E. palustris*. It is most likely that Willdenow made an error in counting or transcribing the number of style-branches, for the material has styles definitely bifid. The plant is characterized by a large number of filiform sterile culms with somewhat inflated sheath-apices. It does not resemble any material that I have seen from North America, but appears to be a glaucous form of the European species, much like specimens which I collected in a tidal stream near Newquay in Cornwall.

Scirpus nudissimus Steud. & Jardin, Bull. Soc. Linn. Normandie, ser. 2, ix. 278, 280 (1875) (a *nomen subnudum*), the TYPE (Paris) coming from Honolulu, has shining dark yellow achenes 1.5 mm. long, with a whitened constricted style-base. It is the same as *E. palustris* β *australis* Nees, Nov. Act. Acad. Caes. Leopold Nat. Cur. xix. Suppl. i. 96 (1843), based on a collection by Meyen from Oahu (COTYPE, Cal. Acad.). Here belongs a specimen from the U. S. Exploring Expedition (G) and also *Degener* no. 9002 (NY, collected May.10, 1927), from an arid part of the campus of the University of Hawaii at Honolulu, and not seen elsewhere by him. These specimens are all exceedingly close to typical *E. macrostachya*, and like *E. obtusa* var. *gigantea* they have probably been sporadically introduced from the North American continent.

[1] Synopsis der Mitteleuropaischen Flora ii². 289 (1904).

[2] Die nordeuropaischen Formen von *Scirpus* (*Heleocharis*) *paluster* L., Acta. Soc. Fauna et Flora Fennica xxiii, no. 7: 1–16, 2 pl. (1902).

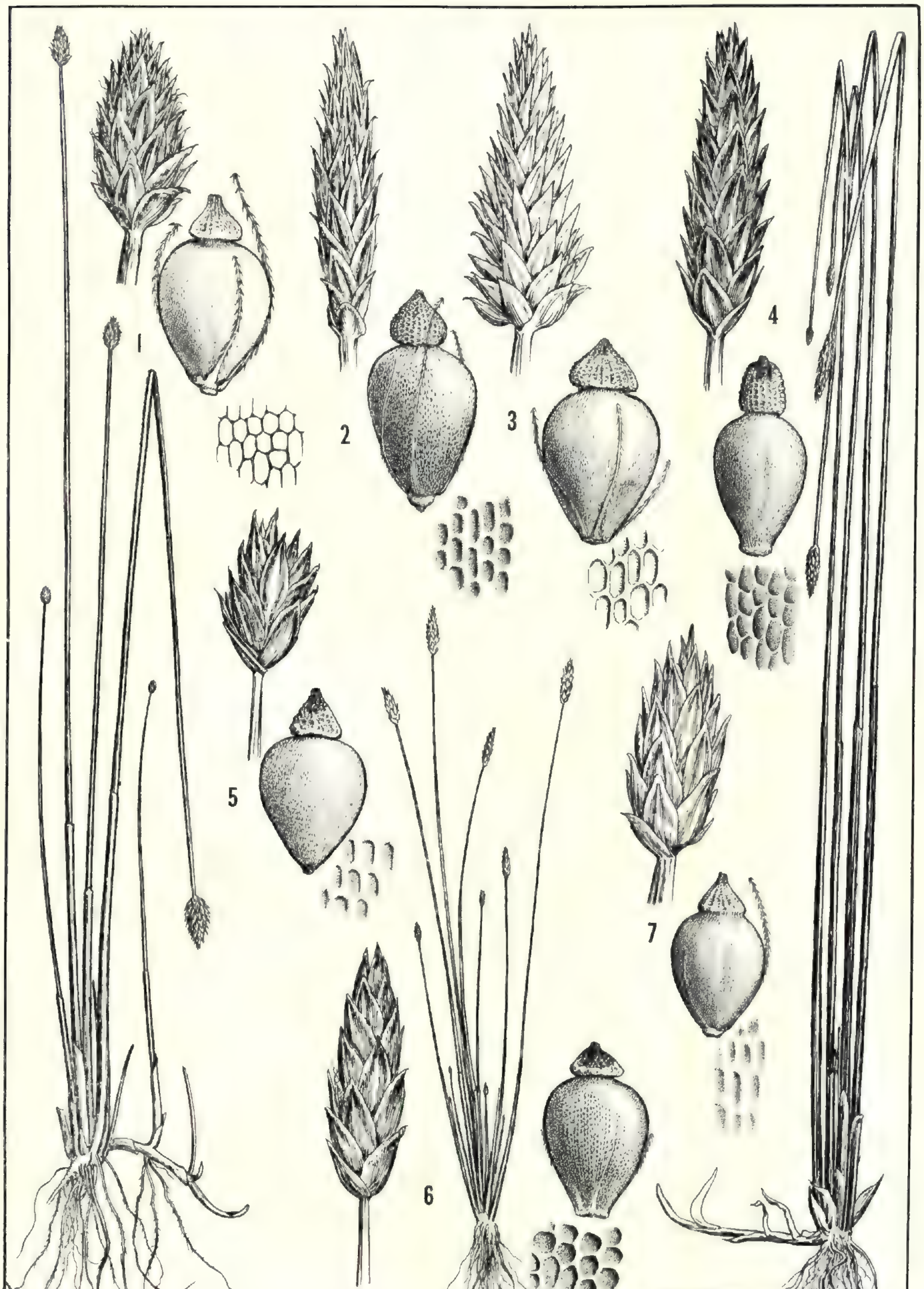
[3] Bull. Soc. Bot. Genève, ser. 2, xiii. 245–265, 4 figs. (1921).

The European *E. mamillata*[1] seems to be well represented in France (Haute Saone, *Bonati* (B)). It probably has earlier names. To me *E. macrostachya* and *E. mamillata* do not appear to be identical, *E. macrostachya* having much firmer scales and a mucronate or submucronate sheath-apex, as well as the following differences in achenes:

E. MAMILLATA	E. MACROSTACHYA
Achenes average 2.1 mm. x 1.1 mm., rather compressed, dull yellow, conspicuously cellular. Tubercle broad and scarcely constricted. Bristle-teeth coarse.	Achenes average 1.8 mm. x 1.0 mm., glistening yellow, smooth, with "lemon rind" texture. Tubercle narrow, with constricted neck. Bristle-teeth slender.

E. macrostachya was fortunately based on excellent specimens around which the western material can be aligned. I have seen a wealth of herbarium material which falls naturally into about a dozen recognizable but intergrading races showing varied shape, color and rigidity of spikelets [cf. PL. 547]. The hardened, twisted culms of the Mexican *E. xyridiformis*—which I believe to be one of these races—can be traced northward into Arizona and to the Uinta Basin of Utah. Northeastward it passes directly into typical *E. macrostachya* of the Oklahoma region, and into a spiralling plant with less-hardened culms characteristic of western Missouri and Kansas, then merges into a soft-culmed phase in Missouri which outwardly resembles *E. mamillata* of Europe. In Mexico, *E. xyridiformis* fades out into softer plants of homogeneous texture but with variously colored spikelets, one type merging at the Texas border into a marked race with long-acuminate pale spikelets. The abundant specimens from the Great Plains of Wyoming represent a combination of these characters, to be expected in the geographical center of the species. This transition passes northwestwardly into short-headed plants of eastern Oregon and eastern Washington with hard purple-margined scales; to the southwest into a similar form with acuminate scales characteristic of the Uinta Basin; southeast to typical *E. macrostachya;* northward in the mountains of Montana to a soft-culmed phase reaching its climax in the region of Glacier Lake and with difficulty, if at all, separable from *E. palustris.* In middle and southern California the culms tend to be

[1] The three species involved are:
56. E. PALUSTRIS (L.) R. & S. [PL. 542, FIGS. 1, 2; PL. 547, FIGS. 9, 10, 14, 15, 19, 21; MAP 64]; Fernald & Brackett, RHODORA XXXI. 59 (1929).
57. E. MAMILLATA Lindb. f. [PL. 542, FIGS. 3, 7; PL. 547, FIGS. 4, 8]; Fernald & Brackett, RHODORA XXXI. 66 (1929).
58. E. MACROSTACHYA Britton in Small, Fl. Se. U. S. 184, 1327 (1903) [PL. 547, FIGS. 3, 7, 11, 13, 17, 18, 20; MAP 67]. *E. xyridiformis* Fernald & Brackett, RHODORA XXXI. 76 (1929) [PL. 547, FIGS. 12, 16].



Eleocharis, subseries Palustres (habit × ½, spikelets × 2½, achenes × 10). Figs. 1, 2, E. palustris. Figs. 3, 7, E. mamillata. Figs. 4–6, E. uniglumis.

Eleocharis (habit × ½, spikelets × 2½, achenes × 10). Fig. 1, E. Savatieri. Fig. 2, E. Dregeana. Fig. 3, E. limosa. Fig. 4, E. debilis. Fig. 5, E. marginulata.

tall and flattened (as in *E. mamillata*) with many-flowered, often elongated, somewhat distichous spikelets, the extreme phase constituting *E. perlonga* Fernald & Brackett.

Along the seacoast from British Columbia to California, *E. macrostachya* passes into large black-spiked plants, frequently uniglumate, and often identified as *E. uniglumis*. The large-headed, occasionally uniglumate, plants from the Canadian Great Plains, represented by *Macoun* nos. 5 (G), 50 (NY), and 300 (G), offer a similar problem; likewise they are involved with *E. palustris*. In many respects the *Macoun* collections are similar to the remarkable plants collected by Dr. Fassett (no. 16739) from a lake-shore at Drummond, Wisconsin; and to Ehler's no. 2763 (Catholic Univ.) from Mackinac County, Michigan, a specimen, however, with the characteristically terete culms of *E. palustris*.

It may be mentioned here, to show the unstable grounds for species determination in this group, that western material of *E. palustris* [cf. MAP 64] has been determined by me almost solely on the character of rigid inflated culms; *E. calva* wholly as slender plants with uniglumate spikelets. *E. palustris* in eastern North America is ordinarily characterized by hardened, terete culms, and ovate spikelets with soft hyaline-tipped scales. But plants with soft flattened culms are occasional, for example *Wiegand* & *Hotchkiss* no. 27521 and *Fernald* & *Wiegand* no. 27520 from Newfoundland. Some specimens (especially *Fernald* & *Wiegand* no. 4698, *Wiegand* & *Hotchkiss* no. 27521, and *Fernald* & *Wiegand* no. 27520) have unusually narrow tubercles, but similar plants (cf. *Fernald* & *Long* in *Pl. Exsic. Gray.* no. 437) from Nova Scotia, have tubercles broader than high.

The *Palustris* group appears to be equally complex in Asia, and I can merely cite the following additional species from eastern Europe and Siberia, included by Zinserling,[1] Flora U. S. S. R. iii. 75–90 (1935), with illustrations, and with Latin descriptions in the addenda:

BIGLUMES:

H. ussuriensis, H. leptostylopodiata, and *H. intersita* (p. 581); *H. crassa* Fisch. & Mey., *H. globularis* (p. 582); *H. kasakstanica, H. ecarinata, H. turcomanica* (p. 583); *H. argyrolepidoides* (p. 584); *H. equisetiformis* (Meinsh.) B. Fedtsch. (p. 72, 80).

[1] For the opportunity of seeing cotypes of many of these species I am greatly indebted to Dr. V. Lubimenko, Director of the Herbarium at Leningrad.

Uniglumes:

H. eu-uniglumis (p. 584); *H. transcaucasica*, *H. Klingei* (Meinsh.) *B. Fedtsch.* (p. 585); *H. multiseta*, *H. septentrionalis*, *H. oxylepis* (Meinsh.) B. Fedtsch., *H. scythica* (P. 586); *H. fennica* Palla (p. 587) (including var. *sareptana*); *H. paucidentata*, *H. Komarovii*, *H. Korshinskyana* (p. 588).

In South America, the *Palustris* group is represented in Argentina, as might be expected, by *E. macrostachya*, illustrated (as *E. palustris*) by Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 443, fig. 8 (1928). One collection, *O. Kuntze* no. 32 (NY), closely duplicates the *perlonga* phase of Texas. The following specimens are cited: Argentina: Prov. Santiago del Estero, *Venturi* no. 5631 (B, G, US); General Roca, Rio Negro, *W. Fischer* no. 160 (G, NY); Alredodores de La Plata, *Cabrera* nos. 1697 (G), 1795 (G). Uruguay: Barra Santa Lucia, *Osten* no. 22713 (B, G). In Patagonia, the Falkland Islands and Chile, the dark-spiked *E. melanostachys* apparently represents the Antarctic element, perhaps identical with *E. neo-zeylandica*, and with achenes somewhat similar to those of *E. Dregeana*.

59. E. neo-zeylandica C. B. Clarke ex T. Kirk, Trans. N. Z. Inst. xxvi. 260 (1894); Cheeseman, Man. N. Z. Fl. 768 (1906); Clarke, Ill. Cyp. t. xxxvi. fig. 10–14 (1909).

E. neo-zeylandica, represented at Kew by Kirk's nos. 1005 and 1248 from Cape Farewell, has inflated sheaths, shiny golden-brown, lightly reticulate achenes 2 mm. long, with unusually small tubercles.

60. E. melanostachys (d'Urville) C. B. Clarke. *Culms usually inflated*, 0.5–6 dm. high, 1–3 mm. wide in dried material, *the surface often roughened by minute internal prominences:* sheaths inflated, often acute to submucronate at the apex: spikelets usually acute, 0.5–2.0 cm. long: scales loosely appressed, *purplish-brown to castaneous* with prominently hyaline tips, often with greenish midrib, the *lowermost frequently striate-pallid:* stamens 3, anthers 2.5 mm. long: style 2-fid: achene obovate, 2.0–2.5 mm. long, lemon yellow, becoming dark lucid brown when mature, lightly reticulate: style-base small, ¼ *as wide as achene*, conic, often as broad as high: bristles equalling the achene, frequently rudimentary or lacking.—Engler, Bot. Jahrb. xxx, Beibl. 68: 20 (1901); Macloskie, Fl. Patagonia viii (suppl.). 67 (1914) (as *H. megalostachys*); Barros (l. c.) 441, fig. 7 (1928). *Scirpus melanostachys* d'Urville, Mém. Soc. Linn. Paris iv. 600 (1826). *Fimbristylis melanostachys* Brongn. in Duperry, Voy. Coquille Bot. 181 (1829); Steudel, Syn. Cyp. 107 (1855). *Isolepis heteromorpha* Steud. Syn. Cyp. 100 (1855). *H. macrorrhiza* Boeckl. Flora xli. 413 (1858). *H. valdiviana* R. A. Philippi, Linnaea xxix. 77 (1857–58). *H. litoralis* Philippi (l. c.). ? *H. melanocarpa* Philippi and *H. appendiculata*

Philippi (op. cit.) 85 (1857–58). *Scirpus heteromorphus* F. Phil. Cat. Pl. Chil. 311 (1881). *E. simulans*[1] Clarke (l. c.) and Ill. Cyp. t. xxxvi, figs. 19–24 (1909). *H. funebris* Speg. Anales Mus. Hist. Nat. Buenos Aires vii. 177 (1902).—Specimens examined: FALKLAND IDS.: *J. D. Hooker* (K); *d'Urville* (Paris) (TYPE of *Scirpus melanostachys:* culms 3–6 cm. high; scales dark brown to black). ARGENTINA: Posadas, Terr. Santa Cruz, *Donat* no. 261 (G, NY). CHILE: Santiago, *Philippi* no. 1879 (Paris) (as *E. appendiculata:* culms scarcely 1 mm. wide; spikelets acute); Santiago, *Philippi* no. 704 (Stockholm) (as *E. appendiculata:* culms slender; sheath-apex cartilaginous, but not apiculate); Corral, *Philippi* no. 642 (Stockholm) (as *E. litoralis:* culms only 4–8 cm. high; scales dark brown); *Philippi* (Berlin) (*E. valdiviana*, similar to *E. heteromorpha*); Valdivia, *Gunckel* no. 2743 (G); Valparaiso, *Jaffuel* nos. 778 (G), 794 (G); Valle de Marga-Marga, Prov. Aconagua, Coast Ranges (lat. 33° 10′ S.) *Jaffuel* & *Pirion* nos. 1433 (G), 3133 (G); Santiago, *Montero* no. 558 (G) and *G. T. Hastings* no. 362 (NY); Prov. Cautin, *Montero* nos. 1993 (G), 2448 (G); Conception, *Jaffuel* no. 2956 (G). PERU: vic. Cuzco, alt. 3600 m., *A. S. Hitchcock* no. 22555 (NY) (perhaps *E. macrostachya*).

61. E. DREGEANA Steud. (PL. 543, FIG. 2). Rhizome coarse and elongate; culm soft, striate, sometimes with minute cellular prominences, 1–3 dm. high, 1–3 mm. wide; sheaths castaneous, loose, the apex somewhat inflated and quickly marcescent-lacerate: spikelets lanceolate, 1–1.5 cm. long, acute, *many-flowered:* the scales obtuse to subacute, castaneous, often with darker margins: stamens 3; anthers 1.3 mm. long: style 2-fid: achene ovate, convex, 1.7 x 1.0 mm., light brown, smooth: style-base yellow, *mucroniform, ¼ – ⅓ the length of the achene-body:* bristles shining brown, with short teeth.—Syn. Cyp. 78 (1855). *E. palustris* sensu C. B. Clarke in Thistleton-Dyer, Fl. Capensis vii. 198 (1898). *Limnochloa capensis* Nees, Linnaea x. 185 (1836) (acc. to Clarke, l. c.). *E. capensis* Nees ex Boeckl. Linnaea xxxvi. 467 (1869–70) (in synonymy).—SOUTH AFRICA: Ongeluk, Griqualand, Jan. 1, 1813, *Burchell* no. 2649 (G, K); Bruintjes Hoogte, Somerset Div., *Burchell* no. 3046 (K); Stylkloof, near Richmond, 4000–5000 ft., *Drège* in 1840 (K); sine loc., *Lehmann* (NY) (as *E. limosa*); *Drège* (Paris) (TYPE of *E. Dregeana*).

The achenes of this plant are of approximately the same size and texture as those of *E. calva* of eastern United States.

62. E. MITRACARPA Steud. Culms usually coarse and spongy, striate, thin and flattened when dry, 1–4 mm. wide: *sheaths loose, purple or reddish-brown at base, the apex truncate, subinflated* and often marcescent: spikelets oblong-lanceolate, subacute, many-flowered: scales castaneous, with subacute hyaline apex, often with green mid-

[1] Cf. RHODORA xxxvi. 385 (1934). Pfeiffer, Herbarium no. 56. p. 54, has taken up the name *H. andina*, based on *Scirpus andinus* Phil. Anal. Univ. Chil. 1873, 554 (1873), in place of *E. simulans*.

rib and darker sides, the lowest not amplexicaule: stamens 3, anthers 2.0–3.0 mm. long: style 2-fid: achene obovate, biconvex, 1.5–2.0 mm. long, dull yellow, smooth: style-base gray, *mitriform*, ¼ *as long as achene-body*, usually thickened at base and cellular-hispidulous under magnification; bristles lightly tinged with brown, equaling the achene.—Syn. Cyp. 77 (1855). *E. palustris* var. ε. *humilis* Nees in Wight, Contrib. Bot. Ind. 113 (1834).—Persia to Japan, Kamtchatka. PERSIA: prope ruinas, Persepolis, *Kotschy* no. 390 (TYPE, Paris). AFGHANISTAN: hb. *Griffith* nos. 6236 (NY), 6237 (NY) & 6238 (NY); Kurrum Valley, *Aitchison* in 1879 (partim, G). INDIA: Ind. bor. occ. *Thomson* (G, NY, Paris); Punjab, *Thomson* (G) (as *E. compacta*); Sersa, Punjab, 800 ft., *Koelz* nos. 1598 (NY), 1599 (NY); Sind, *Pinwill* (NY); Rawalpindi, n. w. India, *Stewart* no. 7060 (NY); Gurdaspur near Beas River, Punjab, *Stewart* no. 1326 (NY); Shalimar, Kashmir, 5000 ft., *Stewart* no. 3232 (NY); Katrain, Punjab, 5000 ft., *Koelz* nos. 1907 (NY), 1644 (NY); Dharmsala, Punjab, 4000 ft., *Stewart* no. 1864 (NY); Lahul, Himalaya, *Koelz* no. 605 (NY); Sikkim, 9–10,000 ft., *Hooker* (G). CHINA: Yunnan, *Ducloux* no. 250; Mengtse, Yunnan, *A. Henry* no. 10862 (NY); Tsingtao, Shantung, *Chiao* no. 2483 (NY); Kweichow, 400 m., *Tsiang* no. 4867 (NY); Peiping, *Liou* no. 6997 (NY); Ning-wu-Hsien, N. Shansi, 5400 ft., *Tang* no. 1296 (NY); Gehol, Mongolia orientale, *David* in 1864 (Paris). JAPAN: Hokkaido, *Tanaka* no. 167 (NY). RUSSIA: Savoiko, Kamtchatka australis, *Hultén* in 1928 (NY); Mt. Palorinaja, Kamtchatka, *Everdam* (G). The following JAPANESE specimens (issued as *E. pileata*) are apparently the same, except for lack of red color in sheaths: Sapporo, hb. *Agric. College* (sine coll.) in 1878 (G); Sapporo, *Arimoto* in 1903 (G); Musashi, *Sakuraj* no. 47 (G).

In India, plants of the *Palustris*-group appear singularly homogeneous, characterized by inflated sheaths, striate culms, firm yellow achenes and a broad, almost orbicular, grayish tubercle. The filament-bases or receptacular part of the achene are as a rule prominently dark-purple. The species ranges from dwarf rigid-culmed plants (cf. *A. Henry* no. 10862 from Yunnan, and some of *Thomson's* collections from the Punjab) to tall plants with soft wide culms (cf. *Koelz* no. 1599 from the Punjab). Spikelets vary in color from nearly white (cf. hb. *Griffith* no. 6238 from Afghanistan, which is an exact match for *Meffert-Abramowitz* no. 572 from Turcoman, issued as *E. argyrolepis*) to dark chocolate-brown (as in *Koelz* no. 1644). The species extends eastward through China and Japan without obvious alteration.

63. E. SAVATIERI C. B. Clarke (PL. 543, FIG. 1). Culms slender, erect, 4–6 dm. long, 0.5–1.0 mm. broad, glistening grayish-green, compressed when dry, obscurely striate: sheaths 6–8 cm. long, bright chestnut to reddish brown, with brown-margined acute apex: spike-

lets elliptic, subacute, 8–12 mm. long, loosely 15–25-flowered: scales soft, obtuse to acute, not keeled, reddish-castaneous striolate, the lowest amplexicaul: stamens 3: style 3-fid: achene elliptic, the castaneous body 1 mm. long, lenticular, broadly obovate, lightly reticulate; style-base elongate-mitriform, 2 mm. long, as wide as the achene-body, strongly inflated-cellular; bristles none.—Kew Bull. Add. Ser. viii. 21 (1908) and Ill. Cyp. t. xxxvi. figs. 15–18 (1909). *Scirpus mitratus* Franch. & Savat. Enum. Pl. Jap. ii. 111, 544 (1879).—JAPAN: in uliginosis, Yokoska, *Savatier* (Paris, TYPE coll.); Yesan, *Fauri* no. 7536 (Paris) (spikelets darker and with firmer scales).

This species, as Franchet & Savatier point out (p. 111), is well differentiated from *Scirpus pileatus* A. Gray, by the presence of a tubercle *twice* as long as the achene-body (as in Clarke's illustration), and by the complete absence of bristles. The illustration is from the type collection of *Scirpus mitratus*, which I have borrowed among other specimens from Paris, through the kindness of Professor Gagnepain.

PALUSTRES (eastern North America)

64. E. CALVA Torr. [PL. 547, FIGS. 1, 5; MAP 65]; Fernald & Brackett, RHODORA xxxi. 68 (1929). *E. erythropoda* Steud. Syn. Cyp. 76 (1855).

E. calva seems to be characteristic of the marl and limestone areas of New York and New Jersey, being almost unknown from eastern New England, and represented by only a single collection from Long Island: Woodside, *Ferguson* no. 4997 (NY). Culms and spikelets are usually slender and elongated; the achenes are small and of fairly constant size, averaging 1.7 x 1.0 mm. in typical specimens. In eastern United States this plant appears to be perfectly distinct and offers no difficulty in identification.

E. Bacothryon Schultes, Mant. ii. 92 (1824) was based on *Scirpus* no. 6, Muhl. Gram. 29 (1817), [incorrectly cited as no. 7 by Torrey], and *E. Muhlenbergiana* Schultes, op. cit., p. 74, was similarly described from Muhlenberg's *Scirpus* no. 4. These numbers I could find neither in Muhlenberg's herbarium at Philadelphia, nor in Willdenow's at Berlin; therefore, since they were inadequately described, both names should be rejected. *Scirpus* no. 7 in hb. Willd. is a very young plant of *E. calva;* in hb. Muhlenberg it is *E. tuberculosa.*

65. E. SMALLII Britton [PL. 547, FIGS. 2, 6; MAP 66]; Fernald & Brackett, l. c., p. 64.

The TYPE of *E. Smallii* (from Harrisburg, Pennsylvania) has rigid swollen culms. This phase, which perhaps reaches its extreme in

Deam's no. 49387 from Bear Lake, Noble County, Indiana (culms 5 mm. wide in dried specimen, *not* flattened) has acuminate spikelets with appressed scales. The type collection of *E. Smallii* is probably pathogenic to some extent, since relatively few of the scales bear mature achenes, and in these the tubercles are swollen and not normal. *Eleocharis* is susceptible to smuts and other fungous diseases resulting especially in slight distortions of the style-base (tubercle), often not obvious to the general botanist. More than one species, in my estimation, has been described on the basis of such pathogenic distortions. In the *Palustres* special care must be observed when it is obvious that fifty percent or more of the achenes fail to mature; even in healthy material the tubercles may be extremely variable (cf. pl. 547, figs. 18, 21). *E. Smallii* is fairly easily recognized by its rigid texture, obvious in the stiff acuminate scales and the hardened character of the sheaths, which are usually black at the apex, with a prominently darkened V-shaped sinus. The achenes average 2.0 x 1.1 mm. It is the prominent and only common species of the *Palustres* in fresh-water ponds of southern New England.

66. E. ambigens Fernald, Rhodora xxxvii. 394, t. 387, figs. 1–8 (1935).

The description of *E. ambigens* by Professor Fernald clears up also the puzzling citations of *E. compressa* (*E. acuminata*) from Louisiana.[1]

Additional citations: Maryland: sea beaches, eastern shore, *Canby* (NY). Virginia: river swamps, Munden, *Mackenzie* no. 1828 (NY); damp location in mixed woods, n. e. of Williamsburg, *E. J. Grimes* no. 3708 (NY). Florida: *Chapman* (NY). Florida or Georgia, *Croom* in 1836 (NY). Louisiana: New Orleans, *R. S. Cocks* no. 1555 (G); *J. Hale* (G, NY) (as *E. acuminata*); Opelousas, *Wm. Carpenter* (NY); Morgan City, *Svihla* in 1926 (NY).

E. nervosa Kuekenthal,[2] perhaps the same as *E. ambigens*, is far too immature for identification. Two collections of the *Palustres* are also known from Porto Rico:

66a. E. fallax Weatherby, Rhodora xxiv. 23 (1922); Svenson, Rhodora xxxiv. 225 (1932).

67. E. halophila (Fernald & Brackett) Fernald & Brackett, Rhodora xxxvii. 395, t. 387, figs. 12–14 (1935). *E. uniglumis* var. *halophila* Fernald & Brackett, Rhodora xxxi. 72, t. 183, figs. 17–26 (1929).—Along the seacoast from the Gulf of St. Lawrence to Virginia.

[1] Britton, Journ. N. Y. Microsc. Soc. v. 109 (1889), the *Hale* specimen being given an unpublished name by Dr. Britton.

[2] Fedde, Rep. Spec. Nov. xxiii. 192 (1926) based on *Ekman* no. 18543 from Cuba: Lagua la Grande, in swamps that surround the limestone hills at Chinchila (type S; cotype NY).

68. E. UNIGLUMIS (Link) Schultes [PL. 542, FIGS. 4–6]; Fernald & Brackett, RHODORA xxxi. 71, t. 183, fig. 31 (1929); Fernald, RHODORA xxxvii. 395, t. 387, figs. 9–11 (1935).—*E. uniglumis* reaches its southern limit in eastern America on the mountains of Newfoundland.

69. E. KAMTSCHATICA (C. A. Meyer) Komorov; Fernald & Brackett, RHODORA xxxi. 75 (1929).

To this species Fernald & Brackett have questionably added (as a synonym) *Scirpus sachalinensis* Meinsh. Acta Hort. Petrop. xviii. 260 (1901). For this Komarov (Acta Hort. Petrop. xxxix. 34 (1923)) has taken up the name *E. Glehni* (*Scirpus Glehni* Meinsh.), published without further reference and apparently a "nomen nudum."

Subseries: TRUNCATAE (North American Species)

Since the name *E. geniculata* is to be applied to the tropical species with lenticular black achenes and *E. capitata*, as a name, is unavailable (see discussion under the *Maculosae*), *E. tenuis* returns as the familiar name for the plant of northeastern United States. After examining the immature type of *Scirpus tenuis* (*Willdenow* no. 1184), I find it best to maintain it as the equivalent of Clayton's specimen, though there is perhaps a tendency toward the var. *pseudoptera*. *Scirpus ellipticus* Willd. no. 1172, sent by Muhlenberg to Willdenow, consists of three immature culms of what I have called *E. capitata* var. *borealis*,[1] and a nondescript culm of an allied plant. At Berlin, the name *Scirpus ellipticus* was in general early use for this northern plant, which, in its shallow achene-pitting and other characters, is probably closer to *E. compressa* than to *E. tenuis*. In view of this taxonomic difficulty, and to avoid a new combination, I am recognizing *E. elliptica*.

70. E. ELLIPTICA Kunth, Enum. ii. 146 (1837) [MAP 29]; Steudel, Syn. Cyp. 76 (1855). *Scirpus ellipticus* Willd. ex Kunth, Enum. ii. 146 (1837) (as synonym). *E. capitata* var. *borealis* Svenson, RHODORA. xxxiv. 200 (1932).

71. E. TENUIS (Willd.) Schultes [MAP 33]. *E. capitata* var. *typica* Svenson, RHODORA xxxiv. 199, t. 219, figs. 56, 57; t. 221, figs. 1, 13 (1932).—Additional citations: WEST VIRGINIA: Morgantown, *Millspaugh* no. 219 (NY); Pickens, Randolph Co., *H. H. Smith* no. 1354 (Wisc). NORTH CAROLINA: many collections in hb. Duke Univ. SOUTH CAROLINA: Hartsville, *J. B. Norton* in 1921 (NY); Charleston, *Beyrich* (Cal. Acad.).

E. TENUIS var. **pseudoptera** (Weatherby) n. comb. [MAP 30]. *E. capitata* var. *pseudoptera* Weatherby in Svenson, RHODORA xxxiv. 202, t. 221, figs. 3, 16 (1932).

[1] RHODORA xxxiv. 200, t. 219, figs. 58, 59; t. 221. figs. 4, 15 (1932).

This variety, of wider range than I had previously suspected, is abundant on western Long Island and on Staten Island. In western New Jersey it is found in meadows with *Castilleja* and *Thalictrum revolutum* and extends southward along the mountains to Tennessee (Fountain City, *J. K. Underwood* in 1920 (B)).

E. TENUIS var. **verrucosa** (Svenson), n. comb. [MAP 32]. *E. capitata* var. *verrucosa* Svenson in RHODORA, XXXIV. 202 (1932).—Extends southward to LOUISIANA: Lake Charles, *Plank* in 1892 (NY); Acadia Parish, *R. M. Harper* no. 3469 (B) and TEXAS: Houston, *E. Hall* in 1872 (NY); and occurs in Virginia (cf. Fernald in RHODORA, xl. 391 (1938).

72. E. COMPRESSA Sull. [MAP 31]; Svenson, RHODORA XXXIV. 215, t. 219, figs. 62, 63; t. 221, figs. 5, 6, 18 (1932).—Noteworthy additions: NEW JERSEY: Dingmans, *K. K. Mackenzie* in 1920 (NY). WEST VIRGINIA: Fayette Co., *L. W. Nuttall* (Duke). ALABAMA: Monte Sano, Huntsville, *R. M. Harper* no. 3405a (B). TEXAS: Dallas, *Reverchon* no. 3595 (NY). NORTH DAKOTA: Custer, *Rydberg* no. 1074 (NY). COLORADO: Mt. Lincoln, *Coulter* in 1873 (NY); Salida, *M. A. Carleton* no. 553 (NY); La Veta, *Rydberg* & *Vreeland* no. 6473 (NY).

73. E. NITIDA Fernald; Svenson, RHODORA XXXIV. 203, t. 219, figs. 54, 55 (1932).

74. E. ACUTISQUAMATA Buckley; Svenson, RHODORA XXXIV. 218, t. 219, figs. 60, 61; t. 220, fig. 7 (1932).

75. E. TRICOSTATA Torr. [MAP 42]; Svenson, RHODORA XXXIV. 219, t. 220, figs. 77, 78 (1932).—SOUTH CAROLINA: boggy places, Santee Canal, *Ravenel* (NY); cane savanna, Sumter Co., *W. Stone* no. 383 (NY).

75a. E. CYLINDRICA Buckley; Svenson, RHODORA XXXIX. 265, t. 464, fig. 5 (1937).

76. E. BOLANDERI A. Gray [MAP 35]; Svenson, RHODORA XXXIV. 224, t. 220, figs. 68, 69 (1932).—UTAH: Moon Lake, Uinta Basin, 8100 ft., *Graham* no. 9318 (Carnegie Mus.). COLORADO: Dolores [Montezuma Co.], 7000 ft. *C. S. Crandall* in 1892 (NY).

77. E. PALMERI Svenson, RHODORA XXXIV. 223, figs. 73, 74; (1932).

78. E. DECUMBENS Clarke; Svenson, RHODORA XXXIV. 224, t. 219, figs. 52, 53 (1932).

79. E. PARISHII Britton [MAP 34]; Svenson, RHODORA XXXIV. 221, t. 220, figs. 66, 67; t. 221, fig. 12 (1932).—Additional citations: NEW MEXICO: Las Vegas, *Plank* in 1895 (NY); Mesilla Valley, *Standley* no. 410 (NY). ARIZONA: Colley's Ranch, *Gooding* no. 1113 (NY). OREGON: Riddle, Douglas County, *Peck* no. 7030 (NY). CALIFORNIA: Mission Creek, Riverside County, *J. T. Howell* no. 2878 (Cal); Panamint Mts., Inyo Co., alt. 3500 ft., *J. T. Howell* no. 4055 (Cal); alkaline flats, Lancaster, Los Angeles County, *J. T. Howell* no. 4894 (Cal); Mission Pine, San Rafael Mts., alt. 6000 ft., *Hoffmann* in 1930

(Cal); Santa Isabel, San Diego Co., *Wolf* no. 2245 (Cal); Clear Creek, Butte County, *H. E. Brown* no. 137 (NY); San Benito County, *R. S. Ferris* no. 6870 (NY); Trinity Center, Trinity County, *J. T. Howell* no. 12692 (NY); Siskiyou County, *L. C. Wheeler* nos. 3230 (B), 2915 (B), 2626 (B).

E. Parishii, which seems to be a derivative of *E. Dombeyana,* is not confined to desert areas, as I previously intimated, but occurs up to 6000 ft. in mountain meadows.

80. E. INTERMEDIA (Muhl.) Schultes. *E. reclinata* Kunth; Svenson, RHODORA XXXIX. 262 (1937).—TENNESSEE: sandy bed of stream, Cedar Creek, Morris Lake Basin, Campbell Co., *J. K. Underwood* (B).

As Professor Fernald has kindly pointed out to me, the previous homonyms of *Scirpus intermedius* do not invalidate the use of the name *intermedia* under *Eleocharis,* provided a legitimate name under *Eleocharis* was not available before Schultes' transfer (1824). Thus in the International Rules of Botanical Nomenclature (1935), Article 69, "Where a new epithet is required, an author may, if he wishes, adopt an epithet previously given to the group in an illegitimate combination, if there is no obstacle to its employment in the new position or sense." "The combination *Talinum polyandrum* Hook. (in Bot. Mag. t. 4833: 1855) is illegitimate, being a later homonym of *T. polyandrum* Ruiz et Pav. (Syst. Fl. Per. 1, 115: 1798): when Bentham transferred *T. polyandrum* Hook. to *Calandrinia,* he called it *Calandrinia polyandra* Fl. Austral. 1, 172: 1863). This is treated, not as a new combination, but as a new name, *C. polyandra* Benth. (1863)."

81. E. MACOUNII Fernald; Svenson, RHODORA XXXIX. 265 (1937).

Subseries: TRUNCATAE

KEY TO SOUTH AMERICAN SPECIES

a. Spikelets linear-lanceolate; scales black; style-base muroniform . . . . . 82. *E. Dombeyana.*
a. Spikelets obtuse; achenes prominently reticulate with conic to depressed-pyramidal style-base . . . . *b.*
  b. Style-base with lobes decurrent on angles of achene
    Rhizome coarse, subterranean; achenes greenish-yellow (Andes) . . . . . 83. *E. crinalis.*
    Rhizome slender, achenes golden-brown . . . . . 84. *E. Rabenii.*
  b. Style-base not decurrent
    c. Dwarf, 3–6-flowered Andean species with black scales; style-base pyramidal . . . . . 85. *E. albibracteata.*
    c. Many-flowered lowland species with brown scales; style-base conical . . . . . 86. *E. montevidensis.*

82. E. DOMBEYANA Kunth, Enum. ii. 145 (1837) [MAP 39]. *E. montana* sensu Svenson, RHODORA XXXIV. 222 (1932), not (HBK) R.

& S. *Chaetocyperus stoloniferus* Nees, Linnaea xix. 695 (1847). *E. truncata* Schlecht. Bot. Zeitung vii. 118 (1849); Steud. Syn. Cyp. 77 (1855). *E. bivaginata* Steud. Syn. Cyp. 77 (1855). *Limnochloa truncata* Liebm. Vidensk. Selskr. Skr. V, ii. 244 (1851). *E. stolonifera* Boeckl. Linnaea xxxvi. 424 (1869–70).

E. Dombeyana may prove to be a plant as local and as misunderstood as *E. montana*, but I am including here, possibly incorrectly, all the material with smooth achenes (under high magnification) and mucroniform style-base. The TYPE (Berlin, *Kunth* no. 3210), based on Dombey's collection from Peru (ex. Mus. Paris) I have not seen exactly duplicated, nor is the locality of collection known. Dombey's plant has slender rhizomes and elongate culms (3 dm. high and nearly 1 mm. wide), bearing acute spikelets (8 mm. long) with dark brown to nearly black scales. The achenes are 1.3 mm. long, golden-yellow to brown, smooth under magnification, trigonous with blunt outer angle, and have a crown-shaped trigonous style-base. This specimen is exceptionally large and the achenes have a peculiar low style-base, but in Dombey's similar specimen at Paris, the style-base tends to be elongated. Should further collections in Peru show *E. Dombeyana* to be distinct, the name to be taken up for the common Mexican-Andean plant would be *E. stolonifera*. The TYPE (*Aschenborn*, hb. *Nees* no. 1737) (Berlin) consists of plants only 6 cm. high, which bear the indefinite locality "Mexico." For *E. truncata*, also from Mexico, two citations are given by Schlectendal: Mineral del Monte (*Ehrenberg*) and *Berlandier* no. 365 (sine loc.). I have not seen these collections, but from description, I believe *E. truncata* is the same as *E. stolonifera*.

Additional citations of *E. Dombeyana:* MEXICO: Morales, San Louis Potosi, *Schaffner* nos. 212 (NY), 577 (NY); *Liebmann* (as *Limnochloa truncata*) (NY); Morelia, Michoacan, 2000 m., *Arsène* no. 2720 (NY). GUATEMALA: Santa Elena, Chimaltenango, 2400–2700 m., *Skutch* no. 419 (NY); San Miguel Uspantan, Quiché, 6000 ft., *Heyde & Lux* no. 3554 (NY). ECUADOR: Ambato, Prov. Tungurahua, *Pachano* no. 110 (NY). ARGENTINA: Sierra Grande, 2200 m., Cordoba, *Burkart* no. 7144 (G); Sierra de San Luis, *Kurtz* no. 8516 (NY); Tilcara, Jujuy, *Venturi* no. 7269 (US, B); Dept. Capital, Tucuman, *Venturi* no. 2276 (US, B); Chigligasta, Tucuman, *Venturi* no. 4753 (G). Without loc.: hb. *d'Urville* (Paris, TYPE of *E. bivaginata*).

My previous Peruvian citations from the Wilkes Expedition should read "Obrajillo" and "Casa Cancha," respectively. Both localities are in the mountains northeast of Callao.

83. E. CRINALIS (Griseb.) Clarke (PL. 544, FIG. 2). MAP 41. Culms *filiform, in dense fascicles on remote ascending branches of a thickened wide-spreading subterranean rootstock,* 4- or 5-angled, sulcate, 4–20 (rarely to 45 cm. as in type) high: sheaths reddish at base, the tumid ferruginous apex truncate and obscurely apiculate: spikelets ovate to elliptic (8–40-flowered), 3–6 mm. long: scales appressed, firm, scarcely keeled, mostly obtuse, castaneous to ferruginous with a lighter midrib: stamens 3, anthers 1.0 mm. long: style 3-fid: achene (0.8–1.0 mm. long, 0.6 mm. wide) greenish-yellow, striolate-reticulate; style-base brown, *acuminate-pyramidal, with prominent basal margin and concave sides;* bristles light brown, slender, equalling the achene.—Kew Bull. Add. Ser. viii. 23 (1908); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 470, 490, fig. 23 (1928). *Scirpus crinalis* Griseb. Pl. Lorentz. 217 (1874) and Symb. Fl. Argent. 311 (1879). *E. Brehmeriana* Boeckl. Allg. Bot. Zeit. ii. 33 (1896); Svenson, RHODORA xxxi. 180, pl. 189, fig. 24 (1929). *E. boliviana* Palla ex Svenson, RHODORA l. c. (p. 179).—BOLIVIA: *Mandon* no. 1416 (G, in part) (K, NY) (COTYPE of *E. Brehmeriana*); La Paz, *Buchtien* nos. 3143 (G, NY), 4482 (TYPE of *E. boliviana*). ARGENTINA: Quebrada del Tala, Catamarca, *Lorentz & Hieronymus* nos. 401 and 448 (Berlin, TYPE); Tilcara, Jujuy, *Venturi* no. 6192 (B, US) (as *E. Chaetaria*); San Pedro, Jujuy, *Venturi* no. 9679 (NY, US); Tafi, Tucuman, *Venturi* nos. 4371 (B, US), 7271 (B, G, US); Famailla, Tucuman, *Venturi* no. 6191 (B, US) (as *E. Chaetaria*); Sierra del Cajon, Tucuman, *Venturi* no. 4371 (G); Campo Quijano, Salta, *Venturi* no. 9445 (B, G, US) (as *E. Chaetaria*), and Guachipas, Salta, *Venturi* no. 9839 (G).

Except for a non-cancellate surface, the achenes of *E. crinalis* resemble those of *E. retroflexa*, with which there has been much confusion in identification. Immature achenes somewhat resemble those of the *Pauciflorae,* in which group I previously and incorrectly placed the plants. *E. crinalis* resembles *E. Rabenii,* but is easily recognized by the brown (not purple) spikelets and coarse rhizomes.

84. E. RABENII Boeckl. (PL. 545, FIG. 3). Perennial, from a *slender, extensively-creeping rhizome bearing appressed purple scales;* culms *capillary, subflexuous,* 8–40 cm. long, quadrangular-sulcate: sheaths purple, appressed, subacute and slightly spreading at the apex: spikelets broadly ovate-lanceolate, *5–8-flowered, 2–3 mm. long:* scales divaricate, ovate, acute, *purplish-brown,* sometimes greenish on the keel: stamens 2; anthers 0.5 mm. long: style 3-fid: achene ovate, trigonous with somewhat costate angles, *lightly cancellate with obscure pitting, brownish-yellow;* style-base pyramidal, acute, dark brown, *trilobed with prominent basal margin;* bristles short, slender, lustrous brown.—Kjoeb. Vidensk. Meddel. 1871: 149 (1871). BRAZIL: without further locality, *Raben* (TYPE, Cop).—URUGUAY: Carrasco, Montevideo, in paludosis dunarum, *Osten* no. 22477 (B).

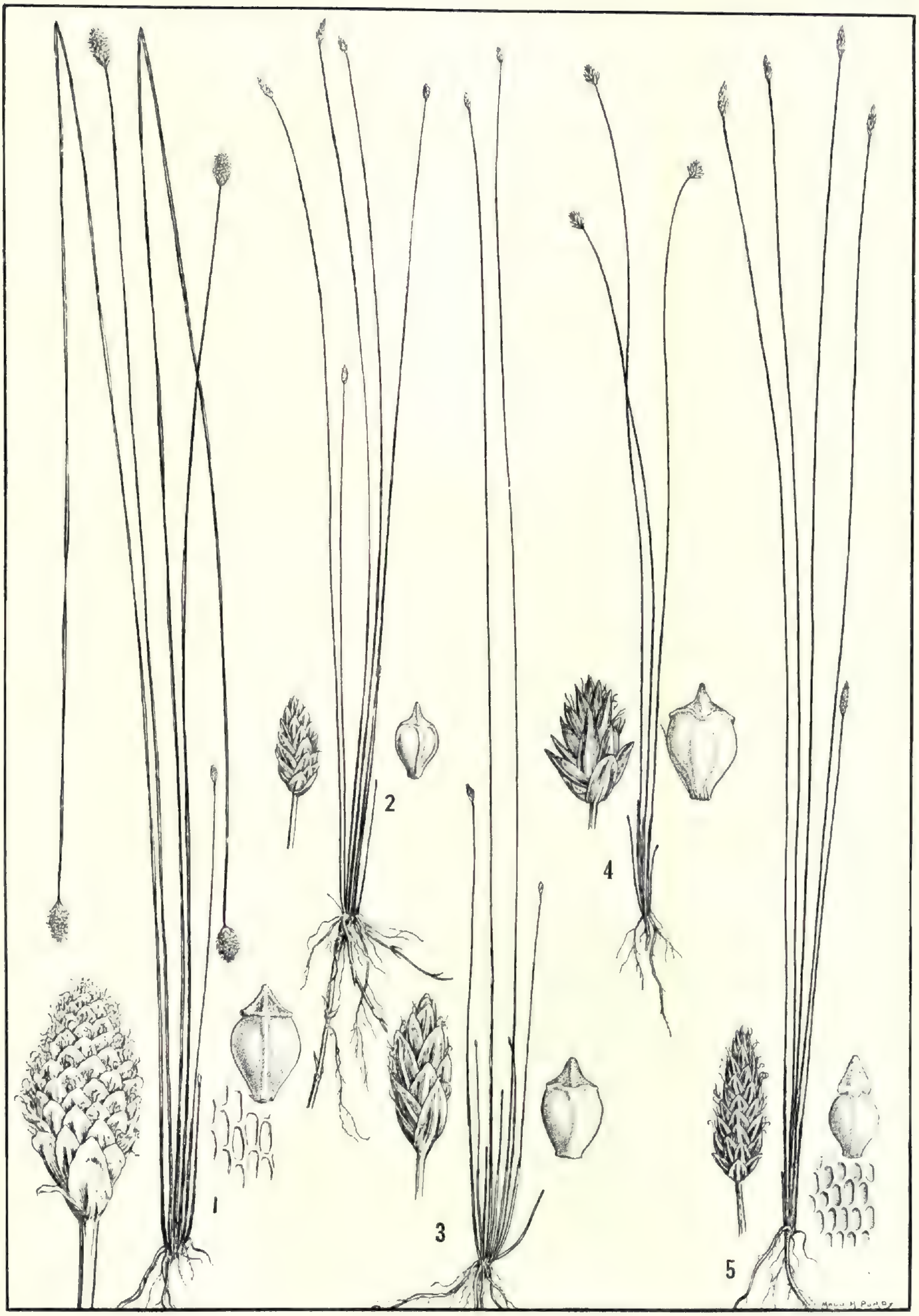
The type is without rootstocks, and these I have described from a collection given to me by the late Cornelio Osten. *E. Rabenii* has the appearance of typical *E. capitata* (*E. tenuis*) as previously treated by me. The achenes of *Osten* no. 22477, being immature, are whitened and smaller than in the type.

85. E. ALBIBRACTEATA Nees & Meyen [MAP 40]; Svenson, RHODORA xxxi. 178 (1929). *E. nubigena* C. B. Clarke; Svenson, RHODORA xxxi. 179 (1929).

The type of *E. albibracteata* (hb. Berlin), from Lake Titicaca, has culms only 3 cm. long. The lowest scale of the spikelet is prominently whitened. Achenes are exactly 1.5 mm. long, golden-yellow with prominently-pitted, reticulate surface, obtuse outer angle, and brown style-base. At Kew the TYPE of *E. nubigena* is annotated by C. B. Clarke as "close to *E.* (*melanocephala*) *albibracteata*, but the mouth of the sheaths will not match, and the apex of the nut is very unusual." In this collection, the achenes (not quite mature) are 1 mm. long, with the three angles of the style-base slightly raised and apiculate. The illustration by Barros of *Lorentz & Hieronymus* no. 65 is identical with mine of *Mandon* no. 1414, both showing achenes evidently not mature. The sheet of *E. melanocephala* Desv. (TYPE, Paris) "Cordillera de Guanta (Coquimbo) . . . 3000 m." consists of ten clumps of specimens, 3–4 cm. tall, with small heads resembling those of *Venturi* no. 9454. In *E. albibracteata* the sheaths are variable, being for the most part inflated at the apex, but sometimes truncate with traces of a mucro. They emphasize the fact that the sheath-apex is not always a good basic character for classification of species in *Eleocharis*.

Additional citations: PERU: alt. 8400 ft., Yura [?], *R. S. Williams* no. 2571 (NY); Cuzco, *A. S. Hitchcock* no. 22493 (NY). ARGENTINA: Tumbaya, Jujuy, 2400 m., *Venturi* no. 6190 (US, B); Tafi, Tucuman, *Venturi* nos. 9454 (US, B) and 9049 (US, B); Chubut, 70° W. 45° S., *Koslowsky* no. 75 (K); Patagonia australis, Terr. Santa Cruz, in ripa lacusculi ad Richmond, *Dusén* no. 5471 (S). CHILE: in Andibus, prov. Coquimbo, *Reed* (K); Valdivia, *Philippi* (K).

The names *E. albibracteata* and *E. Lechleri* are being used indiscriminately for Patagonian and Chilean plants of more spongy texture than seen in typical *E. albibracteata*. These plants have pallid achenes *when mature*, with pitted, sharply-defined reticulation. They probably represent a distinct species, without much doubt already described by Philippi. That they are not *E. Lechleri* is evident from Boeckeler's description of the achene of that species as *testaceous* (i.e. brick-



Eleocharis (habit × ½, spikelets × 2½, achenes × 10). Fig. 1, E. nudipes. Fig. 2, E. crinalis. Fig. 3, E. viridans. Fig. 4, E. pachycarpa. Fig. 5, E. dunensis.

Eleocharis (habit × ½, spikelets × 2½, achenes × 10). Fig. 1, E. minarum. Fig. 2, E. Glazioviana. Fig. 3, E. Rabenii. Fig. 4, E. Urbani. Fig. 5, E. leucocarpa. Fig. 6, E. glauco-virens. Fig. 7, E. Loefgreniana. Fig. 8, E. chrysocarpa.

colored) and the style-base "*minimo* conico, basi satis dilatate incumbente." Boeckeler's type of *E. Lechleri* consisted of dwarf plants with capillary culms ½–1½ inches high, growing near springs in the Cordillera of Ranco [south of Valdivia], Chile. Some of the specimens cited by me from Johnston's collections, and probably all from Patagonia, belong to the species with pallid achenes, and the following definitely so: CHILE: Nubla, *Pennell* no. 12409 (NY). ARGENTINA: Tehuelches, Terr. Santa Cruz, *Donat* no. 67 (G, NY); Patagonia, 50–53°, *Moreno* & *Tonino* nos. 404 (NY), 405 (NY). (The map also includes stations cited by Barros under *E. albibracteata*).

86. E. MONTEVIDENSIS Kunth, Enum. ii. 144 (1837) [MAP 38]; Steudel, Syn. Cyp. 76 (1855); Barros, Anales Mus. Hist. Nat. Buenos Aires, xxiv. 478, fig. 27 (1928). *Limnochloa montevidensis* Nees in Mart. Fl. Bras. ii[1]. 99 (1842). *E. arenicola* Torr. in Engelm. & Gray, Boston Jour. Nat. Hist. v. 237 (1847); Svenson, RHODORA xxxiv. 219 (1932). *E. montana* sensu Britton in Abrams, Fl. Pacific States i. 266, fig. 636 (1923); not (HBK) R. & S. *H. montana* (HBK) R. & S. ssp. *montevidensis* Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2[a], iii. 183 (1932).—Additional citations: MEXICO: Tecate River, Lower California, *Mearns* no. 3786 (NY); Ensenada, Baja California, *Wiggins & Demaree* nos. 4750 (NY), 4772 (NY); Vera Cruz, *F. Mueller* no. 2149 (NY); Durango, *E. Palmer* no. 99 in 1896 (NY); in fossis, Guanaxuato, *Hartweg* no. 241 (NY). TEXAS: Dallas, *Reverchon* no. 1004 (NY); Fort Worth, *Ruth* no. 147 (NY); Horseshoe Lake, Jackson Co., *Drushel* no. 9015 (B); Neuces Bay, *Ravenel* no. 70 (NY); Belknap, *S. Hayes* in 1858 (NY); Guadalupe Mts., Culberson Co., *Moore & Steyermark* no. 3508 (B, NY); Mouth of Rio Grande, *Runyon* in 1926 (NY); Strickland Spring, Kinney Co., *Mearns* no. 1363 (NY). N. MEXICO: Ute Park, *Standley* no. 13969 (NY). ARIZONA: Chiricahua Mts., *Goodman & Hitchcock* no. 1219 (B, NY). CALIFORNIA: San Gabriel Mts., Los Angeles Co., *L. C. Wheeler* no. 2592 (B). ARGENTINA: Candelaria, Salta, *Venturi* no. 9486 (G); Dept. Leales, Tucuman, *Venturi* no. 392 (G); Dept. Capital, Tucuman, *Venturi* no. 2276 (B, US); Duraquito, Tucuman, *Venturi* no. 1548 (B, US); Cordoba, *Kneucker* no. 157 (G). URUGUAY: Montevideo, *Humboldt* ex Sellow (TYPE, Berlin, Kunth hb. no. 3205); Montevideo, *Herter* no. 604 (NY); Barra Santa Lucia, San José, *Osten* no. 22309 (B).

The type is identical with *E. arenicola* from Texas.

87. E. NODULOSA (Roth) Schultes; Svenson, RHODORA xxxix. 255 (1937). *E. chrysocarpa* Boeckl. (PL. 545, FIG. 8).

E. NODULOSA var. ANGULATA Svenson [MAP 36]. Perennial from a *thickened, spongy, horizontal rootstock* with prominent ovate scales; culms erect, 0.5–3 dm. high, 1–2 mm. broad, terete, striate, obscurely septate: sheaths reddish, truncate and mucronate at the apex: spike-

lets cylindric, usually *obtuse*, 5–15 mm. long, about 20–50-flowered: scales firm, not appressed, obtuse to somewhat acute, *lustrous purplish-brown*, sometimes with a green midrib: stamens 3 (or 2); anthers 1.3 mm. long: style 3-fid: achene trigonous, obovate, narrowed at the apex, 1.2–1.5 mm. long, *shining olivaceous* (yellowish when immature), striate-reticulate: style-base trigonous, conic-subulate to broadly truncate-apiculate with a raised margin; bristles equalling the achene. —Rhodora xxxix. 258 (1937). *E. montana* (HBK) R. & S. Syst. ii. 153 (1817); Kunth, Enum. ii. 149 (1837). *Scirpus montanus* HBK. Nov. Gen. et Sp. i. 226 (1816). *E. haematolepis* Steud. Syn. Cyp. 79 (1855), e descr. *E. andesica* C. B. Clarke, Kew Bull. Add. Ser. viii. 23 (1908).

The single large plant representing the type of *Scirpus montanus* from Quindiu Pass [opposite Bogota] in the Middle Cordillera of Colombia was divided between Berlin and Paris, the larger part being at Paris. The thickened rootstocks (4 mm. diam.) and culms, and pitted shiny olivaceous achenes are somewhat like *E. subarticulata* (Nees) Boeckl. (*E. Widgrenii* Boeckl.), but its real affinity is with *E. nodulosa*. Unfortunately, in publishing var. *angulata*, I had not the slightest suspicion that it represented the greatly misunderstood *E. montana*, and I have not been able as yet to find the name *montana* used as a *variety*. *Venturi* no. 8837 (G) from Cerro Nogalito, Tucuman, Argentina, closely resembles the type, both in appearance and achenes, but shows outward septation, which is not discernible in the type of *Scirpus montanus*.

Additional citations: Colombia: Las Cruces, Bogota, 2600 m., *Pennell* no. 2169A (NY); ? *Lehmann* no. 8735 (sine loc.); Andes de Bogota, alt. 2,660 m., *Triana* no. 421 (US, cotype of *E. andesica*).

The achene which I examined from the type collection of *Scirpus montanus* was yellowish and not mature, but identical with immature achenes of *Venturi* no. 8837. Duchassaing's specimen from Guatemala (type, Paris) upon which *E. subnodulosa* Steud. was based, is a slender plant with culms 1 mm. wide, septae far apart, and with small yellow trigonous to planoconvex achenes (1.0 mm. long), with constricted apex. *E. contracta* Maury, from description and figure[1] agrees well with it, and should be placed under the synonymy of *E. nodulosa* var. *subnodulosa*.

88. E. Parodii Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 480, fig. 28 (1928); Svenson, Rhodora xxxix. 262 (1937).

Though probably a distinct species, it has much in common (cf.

[1] Mém. Soc. Phys. Genève xxxi. 139, t. 416 (1890).

Barros' illustration) with *Scirpus montanus*, especially the inflated culms which are septate internally, and the peculiar apex of the achene, as well as the strongly mucronate sheath-apex.

89. E. ELEGANS (HBK) R. & S.; *E. geniculata* of auths., not L. (See discussion under *E. geniculata*.)

89a. E. DENSA Benth.; Svenson, RHODORA xxxix. 262 (1937).

Additional species, apparently of this group (*Truncatae*), have been described and illustrated by Barros (op. cit.), but of these I have seen no authentic material. The species are as follows:

90. E. LECHLERI Boeckl.; Barros, p. 470, fig. 22 (right); Svenson, RHODORA xxxi. 181 (1929).

Barros' illustration closely resembles the type of *E. melanocephala* Desv.

91. E. MENDOCINA Philippi, Anal. Univ. Chil. 1873. 553 (1873) and v. 350 (1896); Barros, p. 484, fig. 22 (left).

The figure by Barros is similar to material included by me under *E. Dombeyana* but the achene described by Philippi as "sub lente fortiori tenuissime ruguloso" certainly would not apply to *E. Dombeyana*. *E. mendocina* came from Mendoza Province (Argentina).

92. E. SPEGAZZINII Barros, op. cit., 474, fig. 25 (1928), known from ARGENTINA: Colonia Resistencia, Chaco; and Prov. Formosa (*Joergensen* no. 2940, in part).

It is exceedingly close to, if not identical with, *E. cylindrica* of Texas.

93. E. HAUMANIANA Barros, op. cit., p. 482, fig. 29 (1928); Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2a, iii. 181 (1932).

This species grows with *E. palustris* in marshy places in the vicinity of Buenos Aires and in Uruguay. I should not be surprised if it turned out to be *E. rostellata*, which is already known from Western Argentina (RHODORA, xxxvi. 384 (1934)).

Series 7: TENUISSIMAE

For species (no. 94–119) see RHODORA xxxix, 210–254 (1937). *E. leucocarpa* Boeckl. Kjob. Vedensk. Meddel. 1869. 132 (1870) is illustrated [PL. 545, FIG. 5].

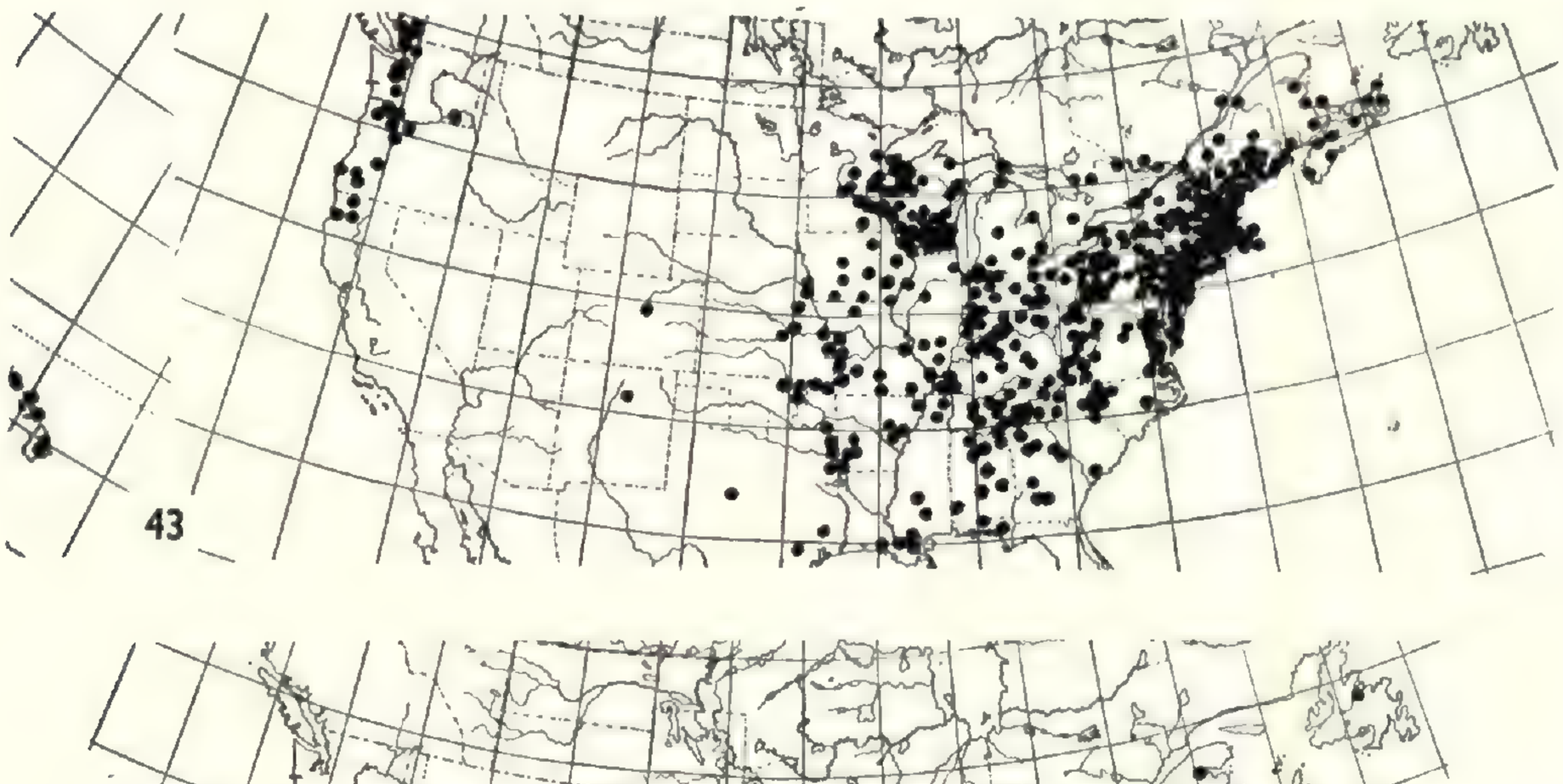
Series 8: SULCATAE

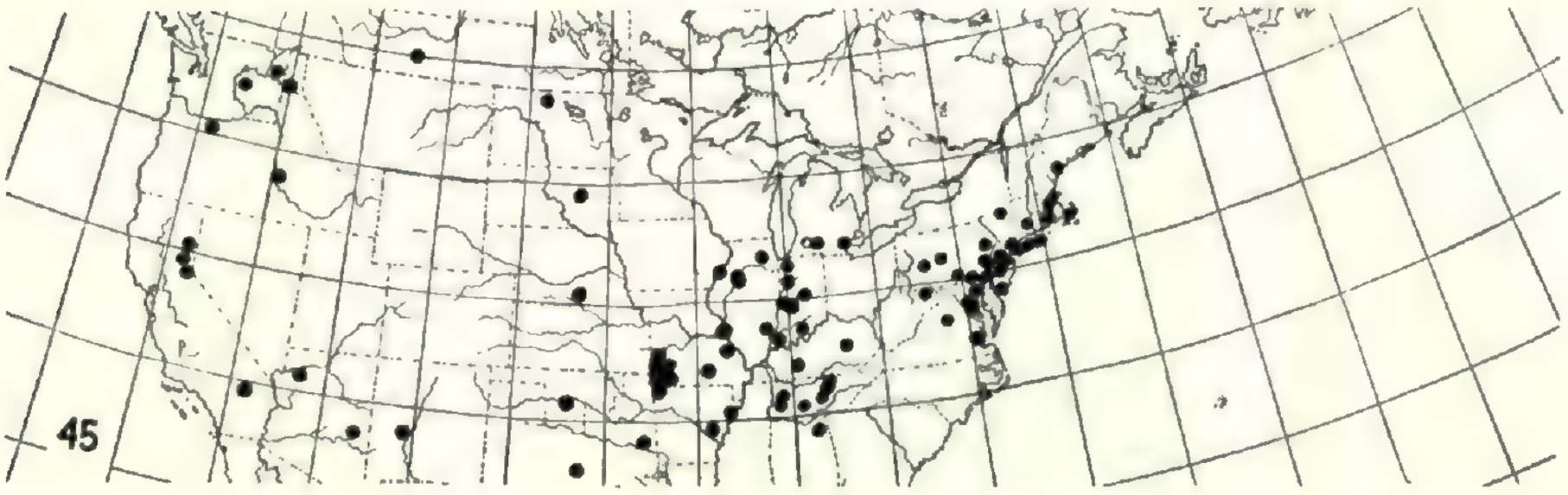
(Achene measurements include the style-base (tubercle))

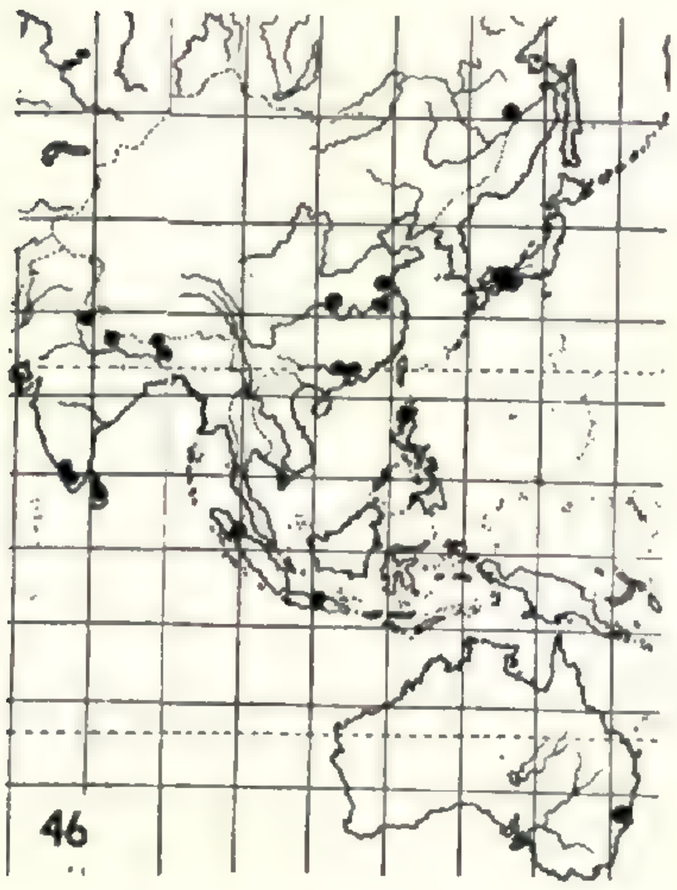
a. Spikelets large (5–12 mm. long) subglobose to ovoid, scales acute to acuminate . . . . . 120. *E. nudipes*.
a. Spikelets not subglobose . . . . *b.*

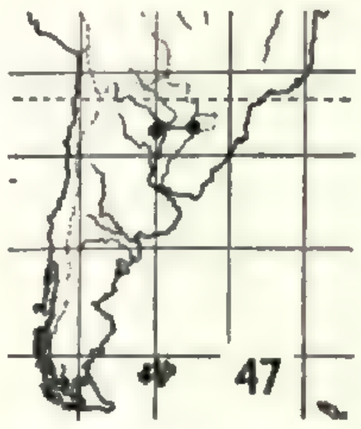
b. Spikelets obovoid, 5–7 mm. long . . . . . 121. *E. pachystyla.*
b. Spiklets cylindric to ovate, mostly subacute . . . . *c.*
c. Culms tuberous-thickened at base, from short lignescent rootstocks . . . . . 122. *E. quinquangularis.*
c. Culms not tuberous-thickened . . . . *d.*
d. Scales emarginate
Achenes 0.8–1.0 mm. long; spikelets many-flowered 123. *E. filiculmis.*
Achenes 1.2 mm. long; spikelets 12–20-flowered 125. *E. Loefgreniana.*
d. Scales obtuse to acute; not emarginate . . . . *e.*
e. Style-base strongly 3-lobed below . . . . *f.*
f. Style-base mitriform; the lobes not decurrent on the body of the subcancellate achene . . . . . 126. *E. dunensis.*
f. Style-base pyramidal the lobes decurrent on the angles of the smooth to reticulate achene
Style-base as wide as the achene; scales purplish-black. Andean . . . . . 128. *E. pachycarpa.*
Style-base narrower than the achene; scales dull brown . . . . . 127. *E. viridans.*
e. Style-base not 3-lobed
Achenes 0.8–1.0 mm. long; spikelets many-flowered 123. *E. filiculmis* (*E. sulcata*).
Achenes 1.2 mm. long; spikelets 5–12-flowered 124. *E. glauco-virens.*

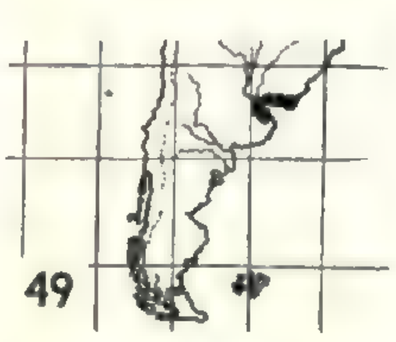
120. E. NUDIPES (Kunth) Palla (PL. 544, FIG. 1). MAP 52. Perennial with coarse knotted ligneous rhizomes; culms stiff, erect, shiny, striate, often twisted, 1.5–6 dm. long, 1 mm. wide: sheaths purplish to stramineous, the apex oblique, firm, apiculate, the mucro often adnate to the cartilaginous surface: spikelets *subglobose, in age becoming broadly ovoid*, obtuse, 5–12 mm. long, *many-flowered:* scales appressed, membranous, oblong-lanceolate, *the subacute to attentuate tips conspicuously whitened*, the lowermost sterile and often spreading: stamens 3, anthers 1.0 mm. long: achene obovate, 1.2 mm. long, trigonous with costulate angles, *pale-stramineous, striate-reticulate:* style-base short, pyramidal, trigonous to lamelliform; bristles none.—Denksch. K. K. Akad. Wissensch. Wien lxxix. 171 (1908). *Isolepis nudipes* Kunth, Enum. ii. 206 (1837); Steud. Syn. Cyp. 100 (1855). *Scirpidium grande* Nees in Mart. Fl. Bras. ii[1]. 97 (1842). *E. grandis* Boeckl. Linnaea xxxvi. 453 (1869–70); C. B. Clarke, Pl. Hassl. 237 (1903) and Ill. Cyp. t. xxxviii. fig. 10–15 (1909); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 462, fig. 18 (1928); Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2, iii. 178 (1932). *Scirpus nudipes* Griseb. Symb. Fl. Arg. 312 (1879). *H. pachstyla* vars. *macrostachya* and *angustostachya* Pfeiffer, Herbarium 2. 55 (1921).—BRAZIL: *Sellow* no. 183 (Berlin, TYPE of *Isolepis nudipes*); *Sellow* no. 1753 (Berlin, TYPE (?) of *Scirpidium grande*); Rio Janeiro a Minas, *Glaziou* no. 16534 (Berlin). PARANA: Curityba, *Dusén* no. 2332 (G); Juguariahyva, *Dusén* no. 10525 (NY, S); Turma, 800 m., *Dusén* no. 1334a (G). MINAS GERAES: Caldas, *Mosén* no. 1080 (S). RIO GRANDE DO SUL: Povo Novo, *Malme* no. 381 (S); Canoas, pr. Porto Alegre, (sine coll. ?)

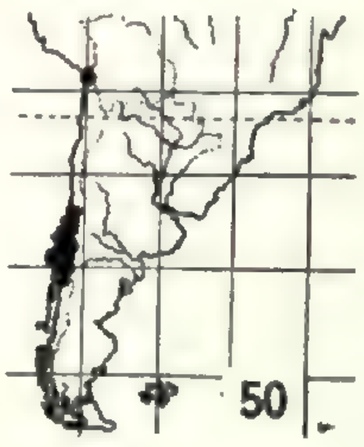


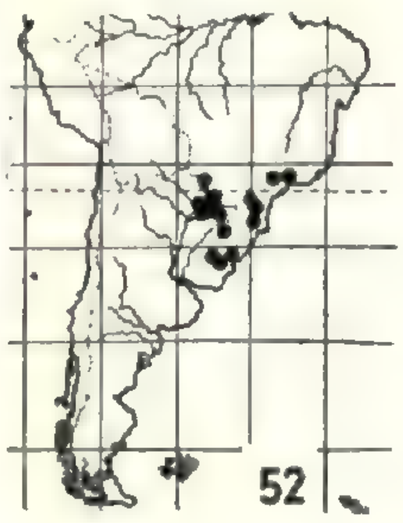












Maps 43–52. Map of Eleocharis; 43, obtusa; 44, ovata; 45, Engelmanni; 46, tetraquetra; 47, quinquangularis; 48, viridans; 49, dunensis; 50, pachycarpa; 51, Loefgreniana; 52, nudipes.

(S). Paraguay: Yerbales, reg. flum. Capibary, *Hassler* no. 4436 (G) (as *E. pachystyla*); pr. Itanguá, *Hassler* nos. 1124 (NY), 1062 (NY), 1064 (NY); Capitindu, á l'est de la Cordillère de Villa Rica, *Balansa* no. 122 (S); in altoplanitie, Sierra de Amambay, *Hassler* no. 11354 (Berlin). Uruguay: Tacuarembó (cited by Osten).

This is one of the most remarkable species of *Eleocharis*, easily recognized (at least when young) by the many-flowered nearly globose heads with conspicuous whitened-attenuate scales, of which an unusually large number at the base are sterile. In the Berlin Herbarium, Kunth's no. 2249 is labeled "Montevideo, *Humboldt* ex Sellow," but the species is not cited from Montevideo by Osten. The specimen probably came from southern Brazil.

121. E. pachystyla (C. Wright) Clarke; Svenson, Rhodora xxxix. 268 (1937).

122. E. quinquangularis Boeckl. [map 47], Cyp. Nov. i. 15 (1888); Maury, Mém. Soc. Phys. & Hist. Nat. Genève xxxi. 136, t. 41a (1889); C. B. Clarke, Bull. Herb. Boiss. ser. 2, iii. 1015 [Pl. Hassler. 237] (1903); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 461, fig. 17 (1928).—Argentina: Sierra de Santa Ana, Misiones, *Niederlein* (type, Berlin); Terr. Chaco, *Joergensen* no. 2625 (G).

This local species of northeastern Argentina has been well illustrated by Maury and by Barros. It is a tall coarse plant related to *E. sulcata*, characterized by short knotted rootstocks, hardened bulbous culm-bases, and thick roots; with culms (often 1 mm. wide), channelled and flattened, much as in *E. Wolfii*. The cylindric blunt spikelets are large, becoming 12 mm. long and 4 mm. wide. The angles of the trigonous, grayish-white achenes (1.0–1.2 mm. long) vary from blunt to strongly costate, and the style-base tends to be mitriform. I believe it is the same as *E. filiculmis* (cf. Rhodora xxxix. 266 (1937)), conforming to the description by Boeckeler "rhizomate abbreviato-culmisque basi tuberascentibus," represented in hb. Berlin by *Kunth* no. 3204a (sub *E. montevidensis*), labeled "*E. filiculmis. Scirpus filiculmis* Schrad. ined. Bahia. Lhotzky legit," and by an identical specimen "*E. filiculmis?* Montevideo, rel. Sellow, *Humboldt*. Hb. Kunth 3204a." I am not absolutely certain that these specimens represent the type of *Scirpus filiculmis* and the type locality, moreover, is obscure. In view of the confusion attending the name, *E. sulcata*, it is best, for the present at least, to maintain *E. quinquangularis* as a distinct species.

E. sulcata Nees (technically a *nomen nudum* until Boeckeler's

citation in 1869–70) was based on *Scirpidium sulcatum* Nees (1842), and primarily on *Macrae's* collection in hb. Lindley from Bahia. Nees included *E. filiculmis* Kunth as a synonym. The name *Scirpus sulcatus* Roth, on the other hand, originated from a collection from eastern Brazil by *Martens* (TYPE probably at Oldenburg).[1] This name, a later homonym of *Scirpus sulcatus* Petit-Thouars, could have been taken up under *Eleocharis* by our present rules (provided no valid name had meanwhile been published), but Boeckeler (1860) had already adopted the new name *E. Rothiana*. However, several older names are probably available. It is possible that *E. emarginata* (Nees) Klotzsch,[2] based on specimens from São Paulo and Campanha (Minas Geraes), belongs here; on the other hand, *E. emarginata* perhaps represents *E. Loefgreniana*.

123. E. FILICULMIS Kunth; Svenson, RHODORA xxxix. 266 (1937).

124. E. GLAUCO-VIRENS Boeckl. (PL. 545, FIG. 6). Perennial from slender descending rootstock; culms filiform, *shining glaucous green*, 15–25 cm. high, flexuous, irregularly striate-sulcate: sheaths brown, stramineous and reddish-punctate above, the apex acuminate: spikelets ovate, 3–5 mm. long, loosely 5–12 flowered: scales not appressed (except the lowest), oblong-ovate, obtuse to emarginate, membranous, castaneous, with broad hyaline margin and punctate greenish keel: stamens 3; anthers apiculate, 0.4 mm. long: style 3-fid: achenes trigonous, *ovate-elliptic, 1.3 mm. long, iridescent greenish-white, lightly reticulate:* style-base ¼ as long as the body, broad to narrowly pyramidal with concave sides, obtuse to acute, the *margin prominent;* bristles cinnamon-brown, equalling the achene.—Cyp. Nov. i. 13 (1888).—BRAZIL: prov. Santa Catherina, *Ule* (hb. *Glaziou* no. 15686) (TYPE, Cop).

E. GLAUCO-VIRENS is related to *E. viridans* and *E. crinalis*, and as in those species the margin of the trigonous style-base is raised. The achene is considerably larger and more elongated than in *E. filiculmis* (*E. sulcata*), which has achenes 1.0 (or sometimes as little as 0.8 mm.) long.

(*To be continued*)

[1] Cf. Bot. Zeitung xxvi. 307 (1828).

[2] Klotzsch ex Boeckl. Linnaea xxxvi. 443 (1869–70); Palla in Usteri, Fl. São Paulo 158 (1911). *Chaetocyperus emarginatus* Nees in Martius, Fl. Bras. ii[1], 96 (1842); Steudel, Syn. Cyp. 74 (1855).

PLANTS NEW TO MINNESOTA

Olga Lakela

Erucastrum gallicum (Willd.) O. E. Schulz[1] occurs in Duluth. This report is substantiated by the author's collections, Nos. 1683 and 1765, under the name of *Radicula obtusa* (Nutt.) Britt., which later were correctly determined by Dr. John W. Moore, University of Minnesota.

In 1911, Dr. B. L. Robinson regarded this species, then under the name of *Erucastrum Pollichii* Schimper et Spenner,[2] as so well established that it deserved to be placed on record as an adventive in America. This record was based on two collections: one from Milwaukee, Wisconsin in 1903, and the other from Sherborn, Massachusetts in 1910. Dr. Robinson's interesting statement follows: "The second station at a great distance from the first suggests that the species is likely to turn up elsewhere."

A study of herbarium specimens reveals that even at that time the species had reached North Dakota. There is a specimen in the University of Minnesota Herbarium collected by Professor O. A. Stevens at Fargo, in 1910, and another by Dr. H. F. Bergman at Grand Forks in 1912. The author's collection, No. 507 was made at Minot in 1930, a considerable distance westward from the Minnesota-Dakota state line. In each locality the plants were collected near Great Northern Railroad tracks.

Obviously the plants have been overlooked in Minnesota until 1936 when they were found on Minnesota Point, on a year-old sand-fill adjoining Oatka Beach Addition. They were common among annual pioneers, but in 1938, when perennials dominated the area, *Erucastrum* migrated to another sand-fill, a bare area, about one-half mile farther south, where it established a plant community with species of *Polygonum* and other annuals.

Dr. P. A. Rydberg in Flora of the Prairies and Plains of Central North America, p. 374, 1932, treated the species as "*Erucastrum Pollichii* Spenner," limiting its range of distribution to Mo., S. D., N. D.

Luzula nemorosa (Poll.) E. Mey. grows in dense, scattered colonies on the south-facing slope of Hunter's Hill in Duluth, in the more open places of the woods where the ground flora is dominated by

[1] Engler's Bot. Jarhb. LIV, Beibl. n. 119 (1916) 56.
[2] Rhodora, XIII: 10–12. 1911

grasses. The collections, Nos. 2492 and 2712, were made on June 26, and August 7, respectively.

This species, of a wide distribution in Europe, has been reported as an adventive in America, occurring locally in New York and Ontario. There is a specimen at the University of Minnesota from Vermont.

SAGINA PROCUMBENS L. grows in moist moss on a wooded terrace sloping to a small pond in Forest Hill Cemetery, Duluth, where the collection No. 2561 was made. The plants cover a considerable area of the terrace and are associated with *Viola pallens* and *Cerastium vulgatum*.

Many deciduous trees are planted along the walks at the terrace level, but the steep hillside above it is under native forest. In America this species is found mostly in the states of the Atlantic coast. It has been reported from Kansas. There are specimens from Louisiana in the University of Minnesota Herbarium.

VALERIANA OFFICINALIS L. has become established on wooded slopes in East Duluth. The collection, No. 2560, was made in a poplar thicket on Snively Road near Morley Park.

This commonly cultivated plant has escaped from cultivation. It is reported from N. E. to N. J. and Ohio.

ANTHEMIS TINCTORIA L. is occasional on roadsides in East Duluth. A sizable colony was found on a gravelly slope on Chester Park Hill near Kenwood, where the specimens, No. 2762, were collected. Another station was located about four miles farther east in Lester Park.

The species has been reported from Maine, N. J. and Ia.

SEDUM TELEPHIUM L. grows in vigorous clumps in several stations in East Duluth. The plants, No. 2728, were collected on the bank of Lester River at the junction of Jean Du Luth road and Snively Boulevard. Near this locality, another colony grows in alder thicket, periodically, at least, under water. In the University Herbarium, there is one collection of this species from Rock County, Minnesota.

PANICUM PHILADELPHICUM Bernh. was found on the sandy shore of Lake Comstock about thirty-four miles north of Duluth, and two miles west from Highway No. 4. In addition to the author's collection, No. 2732, there is a specimen in the University of Minnesota Herbarium from Montevideo, collected by Mr. G. S. Fellows in 1931. The author's determination of these specimens was verified by Mrs. Agnes Chase, United States National Herbarium.

STATE TEACHERS COLLEGE,
Duluth, Minnesota.

Arabis viridis var. heterophylla.—Hopkins in Rhodora **39**: 160 (1937) makes a claim that my *Arabis laevigata* var. *heterophylla* was based nomenclatorially in part upon *A. heterophylla* Nutt., hence is untenable because my plant is not the same as that of Nuttall. This claim has no foundation in fact as the specific name of Nuttall, though identical with my varietal name, had no part whatever in my choice of a name for the Michigan plant; had it in any way been the source of my varietal name I should have written "(Nutt.) n. comb." instead of the "n. var." which was used. It is true that I suggested that the Michigan plant might be the same as Nuttall's species but that is far indeed from making Nuttall's species the source in whole or in any part of the name used by me. Therefore the name *A. viridis* var. *Deamii* Hopkins, l. c. 157 is, under article 60 of the International Rules, an illegitimate name as it was superfluous when published. The correct name is

A. viridis Harger var. **heterophylla** (Farwell), n. comb. (*A. laevigata*, var. *heterophylla* Farwell Ann. Rpt. Mich. Acad. Sci. **19**: 248. 1917).—O. A. Farwell, Lake Linden, Michigan.

Valerianella, a Correction.—The citation given in my revision of *Valerianella*[1] for *V. olitoria* is incorrect.

It should read V. olitoria (L.) Poll. (*Valerianella olitoria* Poll., Hist. Pl. Palat. **1**: 30 (1776)) instead of *V. olitoria* (L.) Dufr. as there stated.—Sarah C. Dyal.

[1] Rhodora **40**: 190 (1938).

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A NEW VARIETY OF IVA CILIATA FROM INDIAN ROCK SHELTERS IN THE SOUTH-CENTRAL UNITED STATES

S. F. Blake

Some time ago Mr. Volney H. Jones, of the Ethnobotanical Laboratory, University of Michigan, sent me for examination fruits of *Iva* and *Ambrosia* from Indian rock-shelters in Arkansas, Missouri, and Kentucky. Although these could be referred definitely to *Iva ciliata* Willd. and *Ambrosia trifida* L., respectively, they were so much larger than any fruits found on herbarium material as to suggest that they might represent distinguishable varieties, possibly evolved through cultivation and selection by the Indians. Mr. Jones has since sent me all the material at hand of these genera from eight rock-shelters in the states mentioned.[1] Study of this material, in connection with published reports of its manner of occurrence in the rock-shelters, leads to the conclusion that these aboriginal specimens represent large-fruited strains developed as sources of food by the bluff-dwellers, and that in the case of the *Iva* the differences are sufficient to justify varietal separation.

The rock-shelters from which the specimens come are located in Carroll, Benton, and Madison Counties, Arkansas; along the Elk River, McDonald County, Missouri; and in Menifee County, Kentucky. The ethnobotany of the Arkansas and Missouri localities, which are in the Ozark Mountains, has been described by Dr. Melvin

[1] The material on which this paper is based was collected by M. R. Harrington for the Museum of the American Indian, Heye Foundation; by W. S. Webb and W. D. Funkhouser for the University of Kentucky; and by S. C. Dellinger for the University of Arkansas. Thanks are due to G. G. Heye and E. K. Burnett, W. S. Webb, and S. C. Dellinger of these institutions respectively for making specimens and data available for study, and to Mr. Volney H. Jones for forwarding the specimens to me and for helpful suggestions in the preparation of this paper.

R. Gilmore,[1] that of the Kentucky locality by Mr. Jones.[2] The rock-shelters themselves are very shallow caves, really mere undercuttings, eroded in precipitous limestone or sandstone bluffs along river gorges. Very little is known about the Indians who inhabited them, beyond the fact that they were certainly pre-Columbian.[3] Gilmore suggests that the Ozark bluff-dwellers may have been contemporaneous with the Basket-maker culture of southern Utah, which is known to be much earlier than the earliest Pueblo culture. Webb and Funkhouser consider it possible that the Kentucky rock-shelter Indians were among the oldest, if not the oldest, prehistoric inhabitants of the state. Both the Ozark and the Kentucky peoples were farmers and left abundant vegetal remains in bags and caches as well as in their feces. Among the more important of their cultivated plants were Indian corn (*Zea mays* L.), Carolina canary grass (*Phalaris caroliniana* Walt.), pigweed (*Amaranthus* sp.), lambsquarters (*Chenopodium* spp.), squash (*Cucurbita pepo* L.), marsh-elder (*Iva ciliata* Willd. var.), giant ragweed (*Ambrosia trifida* L.), and sunflower (*Helianthus annuus* L.). Corn and squash remains are abundant in the Ozarks but rare in the Kentucky shelters, although in general the botanical features of the two cultures are remarkably similar. The rarity of tobacco is interesting. No tobacco or pipes were found in the Ozark shelters, and no pipes have been found in Kentucky. Jones records 3 capsules of a species of tobacco, probably *Nicotiana rustica* L., from the Newt Kash shelter. Tobacco pods and leaves have been reported by B. H. Young and N. C. Nelson from other caves in Kentucky. In any case, the absence of pipes seems to indicate that tobacco was not smoked in this region.

The principal distinctive common feature of the ethnobotany of these two cultures is the occurrence of fruits ("seeds") of two Composites, forms of *Iva ciliata* and *Ambrosia trifida*, both differing from living representatives of these species in their greater size. Gilmore examined a considerable quantity of achenes of the *Iva* in caches from the Ozark shelters but was unable to determine the use to which they

[1] Vegetal remains of the Ozark bluff-dweller culture, Papers Mich. Acad. Sci. **14**: 83–112. *pl. 24–25*. 1931.

[2] The vegetal remains of Newt Kash Hollow shelter, Univ. Kentucky Rep. Arch. & Anthrop. **3**: 147–165. 1936 (forming a section of the paper, Rock shelters in Menifee County, Kentucky, by W. S. Webb and W. D. Funkhouser).

[3] The following papers may be consulted in this connection: M. R. Harrington, The Ozark bluff-dwellers, Amer. Anthropologist **26**: 1–21. 1924; W. S. Webb & W. D. Funkhouser, Archaeological survey of Kentucky, University Kentucky Rep. Arch. & Anthrop. **2**: 419–421. 1932.

had been put, although he suggested the possibility of use as perfume or medicine.[1] In the Newt Kash Hollow shelter in Kentucky the same large-fruited form of this plant was found sparingly throughout the material and in great quantity in every sample of feces examined. The achenes were apparently eaten entire without removing the coat. Jones believes that the great amount of these achenes in the feces indicates that they were used as food, but that the possibility of use as medicine must not be overlooked. He considers that their much greater size as compared with the wild forms now known may be attributed to cultivation, and that the occurrence of this typically prairie plant in such abundance may be due to human introduction as a food plant, although the occurrence of other prairie forms indicates that the region might have been in the prairie stage at the time the shelters were inhabited.

The fruits of a form of *Ambrosia trifida* were found in great abundance in the Ozark shelters, but only a single poorly preserved specimen in the Newt Kash Hollow shelter in Kentucky. Gilmore states that the Ozark specimens are four or five times the size of any that can be found growing as weeds at the present time and are of uniformly light color, suggesting cultivation and selective breeding. After satisfying himself as to their edibility by eating newly ripened achenes, he concluded that the plant was cultivated as a grain crop, although he suggests also that it may have been used to furnish a red dye as it has been by other Indians in historic times.[2] Gilmore's estimate of the size of the rock shelter "seeds" must have been based on comparison with rather small modern ones. I was at first inclined to regard the ancient specimens as worthy of varietal distinction on the basis of their greater size, but after seeing more of them and collecting selected fresh specimens in Washington, D. C., I discovered that all but the very largest of the Ozark specimens could be matched among modern material. Rydberg describes the fruit as about 7 mm. long, and a sample of fresh specimens from Washington County, Arkansas, submitted by Mr. Jones, contains none more than 7.5 mm. long, from which size they grade down to 5 mm. in total length. The Ozark fruits vary from 7 to 13 mm. in total length, but one over 10 or 11 mm. is decidedly exceptional in the material submitted to me. A collection of fruits I made in rich soil along the Chesapeake and Ohio Canal in

[1] Gilmore, l. c. 87, 101. The material was wrongly identified and recorded as *Iva xanthifolia* Nutt.

[2] Gilmore, l. c. 86, 101.

Washington runs from 7.5 to 10.5 mm. in length, and when placed beside a collection from the Ozarks matches it so well, except for the occasional larger fruits in the Ozark material, that varietal separation would not be justified.

The striking difference in size between the achenes of *Iva* from these ancient rock-shelters and those of the living form, however, makes it desirable to differentiate them by a varietal name, even though it is most probable that they represent merely an ancient cultivated strain obtained by selection, and now extinct. The difference in size is in fact so great as to suggest that a different species may have been represented, but the absence of any other observable difference makes this interpretation inadvisable.

Iva ciliata Willd. var. **macrocarpa** Blake, var. nov. Achenia 4.8–9.3 mm. longa 3.2–5.7 mm. lata in utraque facie 3–5(–7)-costata.—Kentucky: Newt Kash Hollow shelter, Menefee Co., 1935, *W. S. Webb & W. D. Funkhouser* (Univ. Mich. Ethnobot. Lab. 1210, 1216, 1217). Missouri: Montgomery shelter, Barry Co., 1925, *S. C. Dellinger* (type no. 37413, Nat. Arboretum Herb.; dupls. in Univ. Ark. Mus., U. S. Nat. Herb., Gray Herb.). Arkansas: Worley rock-shelter, Madison Co., *Dellinger* (Univ. Ark. Mus. 1); Allred Bluff shelter, Benton Co., *Dellinger* (Univ. Ark. Mus. 45, 90), *M. R. Harrington* (Mus. Amer. Indian 11/7380); Agnew Bluff shelter, Benton Co., *Dellinger* (Univ. Ark. Mus. 52); Alum Cave Bluff shelter, Benton Co., *Harrington* (Mus. Amer. Indian 11/7597).

The achenes of modern specimens of *Iva ciliata* are variable in size, shape, and ribbing. They are narrowly or broadly obovate in outline, with or without a definite narrowed stipe-like base, and measure (1.9) 2.3–3.8 mm. in length by (1.5) 1.8–2.6 mm. in width. They are always more or less obcompressed; some are decidedly thickened and nearly evenly lenticular, others are plano-convex, and some, usually the largest, are strongly flattened dorso-ventrally. The smaller ones are usually ribless; the larger are likely to have 3 longitudinal ribs on each face. The apex of the achene, sometimes the margin and surface also, is sparsely hirsutulous or sometimes practically glabrous; the surface is greenish-brown or fuscous, finely longitudinally muriculate-lineolate and sometimes more or less transversely rugulose, and bears scattered sessile glands. The contrast between all the achenes from the rock-shelters and the smaller ribless ones from modern specimens is so great that one would not hesitate to regard them as specifically distinct were the gap not partly bridged by the larger and 3-ribbed modern specimens. On the whole, it seems more likely that the rock-

shelter form represents a large-fruited strain developed by selection than that it is a distinct species or the normal wild ancestral form of the modern plant.

In the bottle of achenes of the type collection I have found also a couple of phyllaries (involucral bracts), one with an achene and a piece of the receptacle bearing several staminate flowers attached, as well as a loose staminate flower. So far as the state of the material permits comparison, there seems to be no difference from the living plant except that of size. The larger (empty) phyllary is about 6.5 mm. long and 3.6 mm. wide, the smaller about 3.8 mm. long and 3 mm. wide. The latter bears a few bristly hairs on the back, as do the modern specimens. A detached staminate flower is 4 mm. long; those borne on the receptacle attached to the smaller phyllary mentioned above are about 3.5 mm. long. A single receptacular pale with them

FIG. 1. *a–f*, IVA CILIATA var. MACROCARPA (from TYPE); *g–h*, I. CILIATA Willd., from *L. F. Ward*, near Belvidere, Kansas, 26 Sept. 1897 (U. S. Nat. Herb.); *i–j*, I. CILIATA, from *Hall & Harbour* 262, American Plains Flora, 1862 (U. S. Nat. Herb.). All × 2.

is about the same length and bears sessile glands along the margin just as do modern specimens, which measure little more than half its length.

A form of the *Iva ciliata* group has been described by Small[1] as *Iva caudata*, and is maintained by Rydberg[2] in the "North American Flora." The only really distinctive feature that appears in their keys and descriptions is the shape of the bracts of the inflorescence. These are described by Rydberg as "ovate to lanceolate, short-acuminate, hispid-ciliate along nearly the whole margin" in *I. ciliata*, and "linear or linear-lanceolate, caudate-acuminate, ciliate only at the base" in *I. caudata*. Small's key character is the same, except that he does not mention a difference in pubescence of the bracts. *Iva caudata* was originally described from Louisiana and Mississippi, but the range of the two as given by Rydberg is essentially the same, except that *I. caudata* is given a range from Illinois and Missouri to Mississippi and

[1] Bull. N. Y. Bot. Gard. **1**: 290. 1899.
[2] N. Amer. Fl. **33**: 5. 1922.

Louisiana, while *I. ciliata* is permitted to grow from the same eastern limit west to Nebraska and New Mexico. Examination of the specimens in the United States National Herbarium shows that the attempted separation corresponds to nothing in nature. The bracts vary from narrowly linear-lanceolate and attenuate to ovate and short-acuminate. The extremes are naturally quite different in appearance, but are connected by such a series of intergrades that no specific or even varietal distinction can be drawn. The alleged difference in pubescence of the bracts mentioned by Rydberg is non-existent. In his original description Small stated that the leaves were thinner and smoother. This is obviously an ecological feature associated with growth in a damp, shady habitat. A specimen from Mississippi labeled *I. caudata* by Rydberg has relatively thick, rough leaves, as do others from Texas (*Ruth* 538; *Joor; Havard*) which have bracts quite as narrow as in specimens labeled *Iva caudata* by Rydberg. *Iva caudata* must be referred outright to the synonymy of *I. ciliata.*

Bureau of Plant Industry,
Washington, D. C.

PANICUM TUCKERMANI
A VARIETY OF PANICUM PHILADELPHICUM

Julian A. Steyermark and Hazel M. Schmoll

Hitchcock[1] and Fernald[2] have regarded *Panicum Tuckermani* Fernald as a valid species of northern distribution, from Quebec and northern Maine to Connecticut, New York, Indiana, and Wisconsin.

A careful study, in the herbarium of Field Museum, of the *capillare*-group of the genus *Panicum* convinced the writers that more specimens than were accessible to us needed to be studied in order to clarify our concepts regarding *Panicum philadelphicum* Bernh., *P. Tuckermani* Fernald, and *P. Gattingeri* Nash. Since the herbarium of Field Museum contained only one specimen of *P. Tuckermani* which had been determined by Fernald (Maine: exsiccated clay, Orono, August 18, 1908, *M. L. Fernald*, in Pl. Exsicc. Gray, no. 113) specimens of *P. Tuckermani* were, therefore, borrowed from the Gray Herbarium. Of the twenty-five specimens from the Gray Herbarium,

[1] Manual of the Grasses of the United States, U.S.D.A. Misc. Publ. no. 200. 667 (1935).

[2] Rhodora **21**: 111–114. 1919.

eleven were collected before 1921 and listed by Fernald[1] in his description of *P. Tuckermani*, where 45 specimens were cited.

Fernald[2] has stated that *P. philadelphicum* is "A southern species, known in New England only locally in Connecticut." Having the characters of "glabrous pulvini" and "spikelets 2–7" in mind, when examining specimens of *P. philadelphicum* in the herbarium of Field Museum, five sheets were segregated as *P. Tuckermani*. All of these specimens, however, were from southern states, and extended the range of *P. Tuckermani* to that of *P. philadelphicum*, thereby breaking down the belief that *P. Tuckermani* was of only northern distribution (KENTUCKY: * Harlan County, August, 1893, *T. H. Kearney, Jr.*: along Poor Fork of Cumberland River, Harlan County, August, 1893, *T. H. Kearney, Jr.*, no. 151; at Poor Fork Post office, Harlan County, August, 1893, *T. H. Kearney Jr.*, no. 151. GEORGIA: * on Yellow River, near McGuire's Mill, Gwinnett County, altitude 750 ft., September 9, 1894, *John K. Small*).

The habit of the specimens of *P. Tuckermani* from the Gray Herbarium varied. The plants, classified according to height, consisted of those 30 cm. or more, and those 30 cm. or less high. Eleven of these, which included the type, were of the tall group. They occurred mostly in tufts and the lowest nodes were often geniculate. (MASSACHUSETTS: * sandy shore of Winter Pond, Winchester, September 22, 1908, *M. L. Fernald*. MAINE: * beach of Lambert Lake, valley of the St. Croix River, Washington County, September 1, 1908, *M. L. Fernald*. NEW YORK: waste ground, open alluvial and marshy flats between the city and Cayuga lake west of the Inlet, Ithaca, August 19, 1913, *E. L. Palmer*, no. 79; damp ledges of Trenton limestone, banks of Black river, Dexter, Jefferson County, August 26, 1922, *M. L. Fernald, K. M. Wiegand,* & *A. J. Eames*, no. 14142; alluvial thickets and damp shores overlying Cambrian (Potsdam) sandstone or Adirondack gneiss, Narrows Island, Black Lake, St. Lawrence County, August 30, 1922, *Fernald, Wiegand* & *Eames*, no. 14143; * gravel along Fall Creek above Forest Home, Tompkins County, Ithaca, August 8, 1918, *K. M. Wiegand*, no. 9141. NEW HAMPSHIRE: * dry roadside, Alstead, August 2, 1900, *M. L. Fernald*, no. 361. VERMONT: head of Lake Memphremagog, September, 1859, *Edw. Tuckerman* (TYPE, in Gray Herb.). WISCONSIN: * St. Croix, "native," 1861, *T. J. Hale*

[1] RHODORA *ibid.*
[2] RHODORA *ibid*

(2 * specimens); * muddy shore of a small kettlehole pond (Sect. 29, T14 N. R 7 E), Big Spring, Adams County, September 22, 1929, *N. C. Fassett, F. M. Uhler* & *W. T. McLaughlin*, no. 9654).

The plants 30 cm. or less high consisted of four fragile forms, i. e., the culms were very slender and the leaves were 1–4 mm. wide, and ten depauperate. Representatives of the fragile forms were (Maine: woods, Biddeford Pool, September 20, 1901, *Geo. G. Kennedy*, no. 1: Woodstock, 1887, *J. C. Parlin.* Wisconsin: sandy shore of Loon Lake, Mellen, Ashland County, September 8, 1927, *N. C. Fassett* & *L. R. Wilson*, no. 5153; * wet shaded sandy shore of Sand Lake 10 miles south of Hayward, Sawyer County, September 4, 1928, *E. M. Gilbert* & *N. C. Fassett*, no. 7284).

Depauperate forms were (Quebec: vallée de la Gatineau, Ironside, August 8, 1921, *Frs. Rolland* & *Marie-Victorin*, no. 15217 (1103); sur rivage du lac des Deux Montagnes, flore des environs de la Trappe, September 14, 1926, *P. Louis Marie*, no. 26; damp magnesian gravel and mud about the asbestos quarries, Black Lake, Megantic County, August 26, 1915, *M. L. Fernald* & *H. B. Jackson;* vallée de l'Ottawa, Ironside, August 26, 1921, *F. Rolland-Germain*, no. 19211; sandy beach of the St. Lawrence, Bellechasse County, Anse St. Vallier, September 15, 1931, *M. L. Fernald*, no. 2501. Massachusetts: * shore of Winter Pond, Winchester, October 20, 1901, *Geo. G. Kennedy.* Maine: river-beach, Mattawamkeag River, Mattawamkeag, September 14, 1898, *M. L. Fernald;* exsiccated clay, Orono, August 18, 1908, *M. L. Fernald* in Pl. Exsicc. Gray. no. 113. Rhode Island: * open gravelly soil, Lincoln, September 16, 1906, *M. L. Fernald.* Vermont: muddy borders of small pond south of Haystack Pond, abundant, elevation 2800 ft., Wilmington, September 25, 1908, *Fred G. Floyd*, no. 2574).

All specimens of *P. Tuckermani* in the herbarium of Field Museum, segregated on the basis of glabrous pulvini, except the specimen collected by *Fernald* in Pl. Exsicc. Gray, no. 113, were tall.

Observations and comparison of the habit of *P. philadelphicum* and *P. Tuckermani* specimens in the two herbaria led the writers to conclude that both species have the same variations in form, i. e., tall, and fragile and depauperate low specimens; and both have specimens with the lowest nodes of the culms geniculate. Furthermore, the culms of *P. Tuckermani* are not more leafy than those of *P. philadelphicum*.

P. Tuckermani, according to Hitchcock's description, resembles

P. philadelphicum and intergrades with it. The use of glabrous pulvini as a distinguishing character between *P. philadelphicum* and *P. Tuckermani* seems to be only a relative term since hair was found on at least one pulvinus on specimens on 10 of the 25 sheets of *P. Tuckermani* from the Gray Herbarium,[1] and 3 of the 5 specimens segregated as *P. Tuckermani* in the herbarium of Field Museum.[2] Furthermore, these hairy pulvini occur only on the lowermost branches of the panicles.

The distribution of hairy pulvini varies also in *P. philadelphicum*. On 5 of the 10 specimens in the herbarium of Field Museum hair occurred on the pulvini of only the lower branches of the panicles. (PENNSYLVANIA: Telford, Bucks Co., August 18, 1921, *W. M. Benner*, no. 276. DISTRICT OF COLUMBIA: sandy hillside among *Rubus* and young *Pinus virginiana*, plants solitary, erect, Deanwood, August 12, 1905, *Agnes Chase*, Am. Gr. Nat. Herb. no. 23. GEORGIA: rocky slope (the form with spikelets larger than typical, noted op. cit. 59), Stone Mountain, August 23, 1905, *A. S. Hitchcock*, Am. Gr. Nat. Herb. no. 24); on the slopes and summit of Stone Mountain, altitude 1000–1686 ft., September 6–12, 1894, *John K. Small*).

Owing to a wide variation in the occurrence of hair on the pulvini and their occurrence on even some of those specimens of the various forms that have been determined as *P. Tuckermani*, the writers believe that "glabrous pulvini" is not a sufficiently stable character to warrant the separation of *P. Tuckermani* as a species.

Fernald[3] gives the following in his description of *P. Tuckermani:* "the branchlets spicate-racemose, with 2–7 short-pedicelled or subsessile spikelets." The spikelets of *P. philadelphicum* and *P. Tuckermani* occur in twos, and are often short-pedicelled, but none were found that seemed to be subsessile. The fact that the spikelets are usually appressed on the branches does not seem to warrant their being called spicate-racemose. To be sure, most of the sheets examined from the Gray Herbarium have 4–7 spikelets appressed to the branches, thereby giving the panicle a dense appearance, but there are sheets of *P. Tuckermani* in the herbarium of Field Museum in which the spikelets occur predominantly in twos and the branchlets are somewhat spreading. (KENTUCKY: along Poor Fork of Cumber-

[1] See asterisk before specimens cited.
[2] See asterisk before specimens cited.
[3] RHODORA ibid, p. 112.

land River, Harlan County, August 1893, *T. H. Kearney, Jr.*, no. 151; Harlan County, August, 1893, *T. H. Kearney, Jr.*)

P. philadelphicum usually has 1–3 spikelets on its spreading branches. The observation that the number of spikelets along a branch and the density of the panicle are too variable to be considered as characters which separate species, is proved by a sheet in the herbarium of Field Museum, a specimen of which has 2–4 appressed spikelets on a branch (Missouri: sandstone slopes, 2½ miles NE of Roscoe, St. Clair Co., October 3, 1936, *Julian A. Steyermark*, no. 20196).

P. Tuckermani cannot be separated from *P. philadelphicum* by its "short-exserted panicles" mentioned by Fernald.[1] There is a wide range in the degree of exsertion in both species. Panicles on which the spikelets are immature are usually narrow, but on mature specimens it is more frequent for the main branches of both species to be widely spreading.

Fernald[2] differentiates *P. Gattingeri* from *P. Tuckermani* by its "shorter and broader leaves, ellipsoid panicle, and more scattered, longer-pedicelled larger spikelets." Field Museum specimens agree with these characters in all except the "shorter leaves." The length of the leaves varies greatly in specimens of *P. Gattingeri* and the spikelets are not only longer in *P. Gattingeri*, but are also more turgid than in the specimens of *P. Tuckermani* and *P. philadelphicum*.

Close comparison of the species has led the writers to believe that *P. Tuckermani* can be considered only as a variety of *P. philadelphicum* and, therefore, should be called

Panicum philadelphicum var. **Tuckermani** (Fern.), comb. nov. *Panicum Tuckermani* Fernald in Rhodora **21:** 111–114. 1919.

Herbarium of Field Museum of Natural History,
Chicago, Illinois

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS—V

H. K. Svenson

(*Continued from page 77*)

125. E. Loefgreniana Boeckl. (pl. 545, fig. 7). Map 51. Perennial; culms *coarse* (ca. 0.5 mm. wide) and *rigid*, 10–17 cm. long, *dull grayish-green*, fasciculate from the apex of an ascending rootstock, striate and obscurely sulcate: sheaths reddish, loose, the apex sub-

[1] Rhodora *ibid.*
[2] Rhodora *ibid.* p. 114.

dilated, obliquely elongate, acute: spikelets lanceolate, sub-acute, 5–8 mm. long, about 2–20-flowered: scales ovate, appressed, chartaceous, castaneous purple with lighter midrib and margins, *deeply emarginate*, the lowest greenish and strongly appressed, *appearing as though a continuation of the culm:* stamens 3: style 3-fid: achene trigonous, obovate, *2 mm. long*, obtusely angled, *semitranslucent, grayish-white*, minutely striate-reticulate: style-base brownish-gray, 1.0 mm. long, pyramidal with acuminate to rounded apex: bristles light yellow, equalling or shorter than the achene.—Cyp. Nov. ii. 12 (1890). *E. leptostachys* Lindm. K. Sv. Vet. Akad. Handl. Bihang 26, Afd. 3, no. 9: 13, t. 1 (1900).—BRAZIL: São Paulo, *Loefgren* no. 146 (Cop, TYPE); São João d'El-Rei, Minas Geraes, ad ripam rivuli inter colles et campos argillosos, *Lindman* [Regnell I] A 129 (S, TYPE of *E. leptostachys*). ARGENTINA: Posadas, Misiones, *Speggazini* no. 20742 (fide Barros, op. cit., 490).

This species is related to *E. filiculmis* (*E. sulcata*), but differs markedly in the rigid glaucescent culms, narrow spikelets with large, deeply-emarginate scales, and much larger achenes. The style-base (probably not correctly shown in Lindman's illustration) is variable, but apparently always sharply-angled.

126. E. DUNENSIS Kuekenthal (PL. 544, FIG. 5). MAP 49. Culms fascicled from ascending branches of a ligneous rhizome; culms capillary, 15–30 cm. long, irregularly sulcate: sheaths purple below, becoming pale brown above, with a dark subacute apex: spikelets oblong, obtuse, 7–9 mm. long, 2.5 mm. wide, many-flowered: scales oblong-ovate, dark brown to castaneous, with lighter midrib, obscurely keeled: stamens 3; style 3-fid: achene obovate, 1.4 mm. long, trigonous, narrowed at the apex (below the style-base), olivaceous, shining, prominently pitted-reticulate (subcancellate); style-base inflated, pyramidal, pallid, trilobed at the base; bristles rudimentary.—Fedde, Rep. Spec. Nov. xii. 94 (1913); Barros, Anales, Mus. Hist. Nat. Buenos Aires xxxiv. 473, fig. 24 (1928); Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2a, iii. 175, fig. 9 (1932).—Moist places in coastal dunes, Uruguay and Argentina. URUGUAY: Priapolis, dept. Maldonado, *Osten* no. 5716 (COTYPE, B).

E. DUNENSIS is related to *E. viridans* with which it grows, and perhaps to the Brazilian *E. minarum*, which is known only from an immature collection.

127. E. VIRIDANS Kuekenthal (PL. 544, FIG. 3). MAP 48. Perennial, with short ligneous rootstock and coarse roots: culms filiform, 15–30 cm. long, quadrangular-sulcate: sheath purplish to pale brown, the apex truncate to oblique, often with a rudimentary mucro: spikelets frequently proliferous, oblong, subobtuse, 5–10 mm. long, many-flowered: scales elliptic, obtuse, dull reddish-brown, often with a

broad green midrib: stamens 3; anthers 2.0 mm. long: style 3-fid: achene broadly obovate, 1.0–1.2 mm. long, trigonous with prominent angles, shining, greenish to pale gray, smooth to obscurely striate-reticulate: style-base pyramidal, brown, trilobed, with the lobes often excurrent on the achene-angles; bristles none or rudimentary.—ex Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2a, iii. 175 (1932). *E. intermedia* Maury ex Micheli, Mém. Soc. Phys. Génève [Fl. Paraguay] xxxi. 137, t. 41A (1890), not (Muhl.) R. & S. *E. sulcata* var. *grandirostris* Lindman, K. Sv. Akad. Hand. Bihang xxvii. Afd. 3, no. 9: 13, t. 6, fig. 2 (1900). *E. prolifera* Osten (op. cit.) 177 (1932), not Torr.—URUGUAY: in arenosis maritimis humidis, Canelones, *Osten* no. 6907 (B) (COTYPE of *E. viridans*); Carrasco, Montevideo, *Osten* nos. 22478 (B), 22527 (B) (as *H. prolifera*) and *Herter* no. 606 (G, NY) (as *H. tenuis*). PARAGUAY: Villa Rica, *Joergensen* no. 3581 (as *E. acicularis*) (NY); S. Paraguay, *O. Kuntze* in 1892 (as *Scirpus filiculmis*) (NY). BRAZIL: in arenosis apricis subuliginosis, oppidum Rio Grande, Rio Grande do Sul, *Lindman* [Regnell I] A 601 (G) (COTYPE of *E. sulcata* var. *grandirostris*).

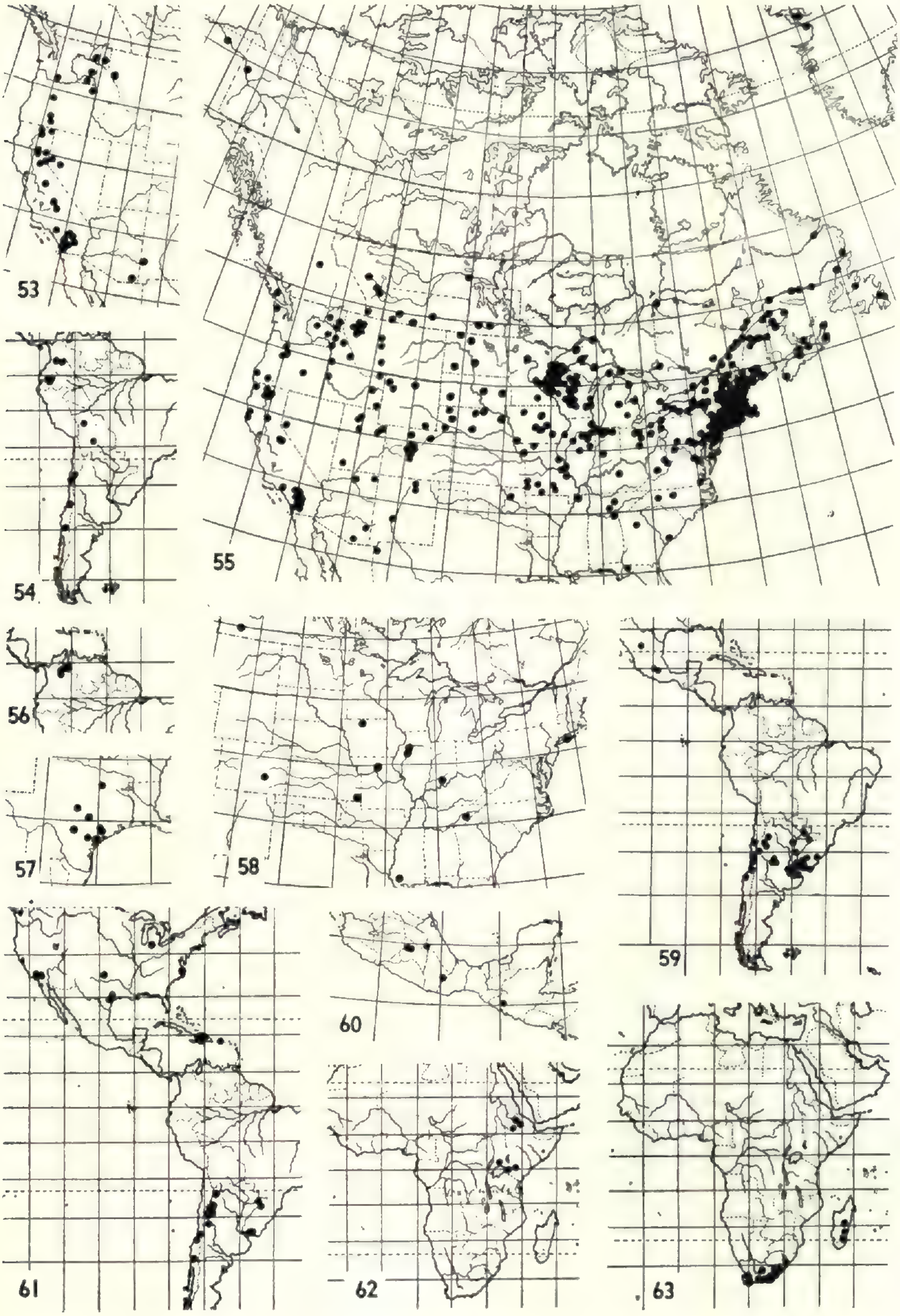
Specimens have been received from Uruguay through the kindness of Mr. Osten. The collections vary considerably, no. 22478 appearing surprisingly like *E. vivipara* of southeastern United States, and diverging from that species only in the comparatively smooth achene-surface. In no. 22478 the achenes seem to be more mature than in the type collection, the surface sometimes becoming gray, with obscure striolate reticulation, and the style-base only obscurely trilobed. Still both appear to be the same species. Citations of *E. pachycarpa* from Uruguay should undoubtedly be referred to *E. viridans*, which has a somewhat similar achene.

Lindman's illustration was quite evidently drawn from young achenes, which have a smooth semi-translucent buff surface, and relatively larger style-base. *E. sulcata* var. *grandirostris* is therefore, without doubt, the same as *E. viridans*, and so is Jörgensen's specimen (no. 3581) from Villa Rica (the type locality of *E. intermedia* Maury). Much difficulty is encountered here in descriptions and illustrations of immature achenes, and I am of the opinion that Barros' illustration[1] of *H. Niederleinii* Boeckl., also represents *H. viridans*. It shows achenes practically the same as in Lindman's illustration of var. *grandirostris* [lower right] and also one approaching the mature stage [upper right].

128. E. PACHYCARPA Desv. (PL. 544, FIG. 4). MAP 50. Perennial, with a thickened descending rootstock; culms fascicled, *rigid, filiform,*

[1] Anales Mus. Hist. Nat. Buenos Aires xxxiv. fig. 13 (1928).

ELEOCHARIS, series MULTICAULES (habit × ½, spikelets × 2½, achenes × 20). FIG. 1, E. MULTICAULIS. FIG. 2, E. CONGESTA. FIG. 3, E. CARNIOLICA. FIG. 4, E. LAEVISETA.



Maps 53–63. Map of Eleocharis, 53, bella; 54, exigua; 55, acicularis; 56, stenocarpa; 57, Reverchonii; 58, Wolfii; 59, bonariensis; 60, nervata; 61, radicans; 62, marginulata; 63, limosa.

10–40 cm. high, erect to recurved, *frequently proliferous:* sheath purple to stramineous, the apex rigid, acute, appressed: spikelets ovate, compressed, 5–10 mm. long, about 8–16-flowered: scales loosely subdistichous, ovate-lanceolate, obtuse to acute, *purplish-brown to nearly black,* usually with a green midrib, not conspicuously hyaline at the margin: stamens 3, anthers 2.0 mm. long: style 3-fid: achene trigonous with obtuse angles, orbicular-ovate, *1.2–1.5 mm. long,* smooth, yellowish-white: style-base pyramidal, subacute to acuminate, the trilobed base *decurrent on the angles of the achene:* bristles slender, equalling the achene or frequently absent.—Desv. in C. Gay, Fl. Chil. vi. 174 (1853); Boeckl. Linnaea xxxvi. 451 (1869–70); C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 22 (1901); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 464, fig. 19 (1928); Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2a, iii. 180 (1932). *E. leptocaulis* Steud. Syn. Cyp. 77 (1855) (fide Clarke, l. c.). *H. fuscosanguinea* Boeckl. Linnaea xxxvi. 425 (1869–70) (fide Clarke). *H. liocarpa* Philippi, Anal. Univ. Chil. 1873: 553 (1873) (fide Clarke). *H. lepida* F. Philippi, Anal. Univ. Chile xciii. 349 (1896) (fide Clarke). —Chile: *Philippi* no. 926 (Paris) (det. *Desvaux*); *Philippi* (K, Paris) (*E. dubia* and *E. leptocaulis*); Constitution, *Philippi* in 1888 (K) (*E. dubia*); Conception, *Jaffuel* no. 2954 (G); Paso Cruz, 34°, *O. Kuntze* 128 (K); Corral, Philippi (K, as *E. dubia*) and *Buchtien* no. 248 (K); Imperial, Prov. Cautin, *Montero* no. 2007 (G); Temuco, *R. M. Middleton* in 1905 (S); Valdivia, *Buchtien* no. 244 (K), 247 (K) and in 1905 (G) (as *E. leptocaulis*); Valdivia, *Philippi* (K) (Berlin, as *E. leptocaulis*), and *Gunckel* nos. 1903 (G), 1986 (G), 2035 (G), 2045 (G), 3045 (G); Prov. Valdivia, *Lechler* no. 453a (K); in insula Valenzuela prope Valdivia, *Lechler* 249 (K).

Except for an isolated citation by Clarke (l. c.) from Prov. Arica, all the specimens that I have seen, with one exception, come from the coast or mountains of southern Chile. The exception is a collection from Port Jackson District, Australia (G, NY, etc.), distributed as *E. acicularis.* Mr. S. T. Blake has informed me that this is the only known occurrence in Australia. Whether these specimens are the result of a casual introduction or represent another natural link with the Patagonian flora may be left to the reader's imagination. It is hard to ascertain what are Philippi's actual types, but only a single species appears to be represented in Chile, and Clarke's synonymy may be accepted without further question.

Series 9: Multicaules[1]

a. Culms 4-angled; achene-bristles enlarged, almost plumose (Orient) . . . . . 134. *E. tetraquetra.*
a. Culms not 4-angled, or obscurely so; bristles not plumose, b.
b. Upper sheaths mucronate, *c*.
c. Style-base echinate; culms strongly fluted (Australia) 139. *E. acuta* var. *pallens.*
c. Style-base smooth; culms striate to smooth, *d*.
d. Achenes sharply trigonous
Spikelets pale; culms coarse (Australia) . . . . . 140. *E. Dietrichiana.*
Spikelets purplish; culms slender (Madagascar) . . . 132. *E. Baroni.*
d. Achenes biconvex to obscurely trigonous
Scales obtuse, strongly deciduous; spikelets obtuse (Australia) . . . . . 138. *E. cylindrostachys.*
Scales acute to acuminate; spikelets acute
Achenes 2.0 mm. long; spikelets frequently proliferous (South Africa) . . . . . 131. *E. limosa.*
Achenes 1.5 mm. long; spikelets not proliferous (Australia) . . . . . 139. *E. acuta.*
b. Upper sheath oblique; not mucronate, *e*.
e. Perennial; rootstocks coarse and lignescent, *f*.
f. Culms coarse; achenes 1.5–2.0 mm. long
Culms 2–4 dm. high (Europe; Australia) . . . . . 129. *E. multicaulis.*
Culms 4–7 dm. high (E. Africa) . . . . . 130. *E. marginulata.*
f. Culms filiform; achenes 1.5 mm. long (New Zealand) 141. *E. Cunninghamii.*
e. Annual; or perennial by inconspicous tenuous rootstocks, *g*.
g. Achenes trigonous; style 3-fid
Culms filiform
Style-base much narrower than achene (Orient) 136. *E. pellucida.*
Style-base nearly as broad as achene; bristles without teeth (Korea) . . . . . 135. *E. leviseta.*
Culms coarse and rigid (India) . . . . . 137. *E. congesta.*
g. Achenes lenticular; style usually 2-fid (Europe) . 133. *E. carniolica.*

129. E. multicaulis Sm. (pl. 546, fig. 1). Perennial, with a stout caudex bearing thickened yellowish roots; culms rigid, often recurved, 1.5–5 dm. high, markedly striate, *frequently with proliferous spikelets:* sheaths stramineous to purplish, the oblique apex acute to attenuate: spikelets ovate-lanceolate, acute, 5–13 mm. long; scales reddish-brown, sometimes with a greenish midrib, obtuse to acute, the lowermost amplexicaul and usually erect: stamens 3, anthers 2.0 mm. long: *style 3-fid:* achene 1.5–2.0 mm. long, *trigonous*, narrowly obovate, olive-brown, lightly striolate: style-base 0.5 mm. long, gray, acumi-

[1] In Australia, in addition to the European *Eleocharis multicaulis*, a single collection (Port Jackson (G)) of the Andean *E. pachycarpa* is known. *E. acicularis* also has been introduced into Australia; between it and *E. pusilla*, as Mr. S. T. Blake writes me, all intermediate stages are found. Likewise, *E. atricha* is apparently an infertile member of the *Acicularis*-group, of which I have seen the type collection, *R. Brown* no. 5929 from Port Jackson (Br. Mus.) and a specimen sent me by S. T. Blake, collected by him in Brisbane (no. 4714); both are unidentifiable, but have much the appearance of slender *E. bonariensis*. It is probable that species of sporadic occurrence in other groups (i.e. *Maculosae*) have been introduced.

nate, sharply trigonous with rounded basal lobes; bristles equalling or shorter than the achene.—Engl. Fl. i. 64 (1824); Dietr. Sp. Pl. ii. 46 (1833); Kunth, Enum. ii. 149 (1837); Parlatore, Fl. Ital. ii. 68 (1852); Steudel, Syn. Cyp. 77 (1855); Boeckl. Linnaea xxxvi. 457 (1869–70); Benth. & Mueller, Fl. Austr. vii. 295 (1878); C. B. Clarke, Journ. Bot. xxv. 271 (1887); Terraciano, Malpighia ii. 308 (1888); Aschers. & Graebn. Syn. Mitteleurop. Fl. ii^2. 294 (1904); Hegi, Ill. Fl. Mitteleurop. ii. 40, fig. 197 (1908); Black, Fl. S. Australia 91 (1922); Ewart, Fl. Victoria 224, figs. 128, 129 (1930). *Scirpus multicaulis* Sm. Fl. Brit. i. 48 (1800); Coste, Fl. France iii. 478, fig. 3793 (1904). *E. gracilis* R. Br. Prod. 224 (1810); Boeckl. Linnaea xxxvi. 430 (1869–70). *Scirpus tener* Spreng. Syst. i. 204 (1825). *Clavula multicaulis* Dumort. Fl. Belg. 143 (1827). (For further illustrations cf. Index Londinensis.)

A member of the Atlantic element of western Europe extending from southern Scandinavia and Scotland to the Azores and northern Africa; eastward to Russia according to Ascherson & Graebner (l. c.) and to Hegi (l. c.), but not listed by Zinserling in Komorov, Fl. U.S.S.R. 1935.

This species was evidently introduced into Australia at a very early date, for Robert Brown obtained specimens from Port Jackson before 1810.

Australian specimens examined: Port Jackson, *R. Brown* (type, Br. Mus., K); Goulburn R., *F. Mueller* (K); Marrabeen, near Sydney, *S. T. Blake* nos. 7429 (B), 7431 (B); Wallangarra, s. e. Queensland, *Blake* no. 4466 (B).

130. E. marginulata Hochst. (pl. 543, fig. 5). Map 62. Perennial, with stout rootstocks (as in *E. multicaulis*) and coarse gray roots: culms striate, terete, 4–8 dm. long, sheaths truncate with a short mucro: spikelets lanceolate to ovate, obtuse, 1–1.5 mm. long, *frequently proliferous:* scales ovate-oblong, obtuse, *dull brown with greenish keel:* stamens 3; style 3-fid: achene obovate, obtusely trigonous to lenticular, olive-brown, punctulate-reticulate: style-base pallid, short-pyramidal; bristles equalling or shorter than the achene.—Hochstetter ex Steud. Syn. Cyp. 78 (1855); Boeckl. Linnaea xxxvi. 457 (1869–70); C. B. Clarke in Durand & Schinz, Consp. Fl. Afr. v. 598 (1895), and in Thistleton-Dyer, Fl. Trop. Afr. viii. 410 (1902). *E. striata* Hochst. ex Steud. Syn. Cyp. 78 (1855).—Abyssinia: in palud. prope Adoam, *Schimper* no. 915 (K, Paris (type)); prope Enschadcap, in monte Bachit, prov. Simen, *Schimper* no. 1331 (K) (cotype of *E. striata*). British East Africa: Ruwenzori Exped., marshes in Mau district (K); north of Lake Nyassa, *Stolz* no. 1072 (Cop, K); Forest Station, alt. 2300 m., Kenia occid., *R. E. & Th. Fries* no. 389 (K).

E. marginulata might well be the ancestral form of *E. multicaulis*.

It has the same type of coarse roots and rootstock, and similar proliferous culms which become as long as 7 dm. in *Schimper* no. 915. The achenes also are much the same. However, the collections in East Africa are few, and there is also some difficulty in determining the material which lies between *E. limosa* and *E. marginulata.*

131. E. LIMOSA (Schrader) Schultes (PL. 539, FIG. 6; PL. 543, FIG. 3). MAP 63. Culms from a short woody rhizome, 2–6 dm. high, 1–5 mm. wide, striate, *terete, with firm brown pith;* sheaths loose, soft, the apex acute; *spikelets frequently proliferous,* cylindric to acuminate, 1–2 cm. long, 3–4 mm. wide: scales obtuse to acute, often inrolled at the margins, castaneous to dark brown, not keeled: stamens 3, anthers 1.5 mm. long: style 3-fid: achene trigonous to lenticular, obovate, 1.5–2.0 mm. long, olive brown, the surface pitted-reticulate: style-base gray, trigonous, elongate-pyramidal, ½–⅓ as long as the achene-body; bristles from a prominent base, shining brown, equalling the achene.—Mant. ii. 87 (1824); Kunth, Enum. ii. 148 (1837); Steud. Syn. Cyp. 78 (1855); C. B. Clarke in Durand & Schinz, Consp. Fl. Afr. v. 598 (1895), and Thisleton-Dyer, Fl. Capensis vii. 198 (1898); Schonland, S. Afr. Cyp. [Bot. Surv. S. Afr. Mem. 3] 33, t. xxvi (1922); Chermezon, Cat. Cyp. Madag. 36 (1931). *Scirpus limosus* Schrader, Goett. Gel. Anz. iii. 2069 (1821) and Anal. fl. Cap. 129, t. 2, fig. 1 (1821). *E. sororia* Kunth, Enum. ii. 148 (1837); Steud. Syn. Cyp. 78 (1855).—South Africa and Madagascar. SOUTH AFRICA: Port Alfred, *Burchell* no. 3802 (G, K); Zoetemelks River, *Burchell* no. 6607 (G, K, Paris); Umlaas River, Natal, *Kraus* in 1840 (K); Cape of Good Hope, *Zeyher* in 1847 (Paris); "E. limosa Kth. b" *Drège* (?) (NY). MADAGASCAR, Antsirabe, *Perrier de la Bâthie* no. 13570 (B).

E. sororia was merely a new name for *Limnochloa capensis,* which seems to be confused as to identity. It perhaps represents the plant of the *Palustres* which I have definitely treated as *E. Dregeana.* Occasionally, as in *Burchell* no. 3802, bifid styles will be found intermingled. Therefore names based essentially on the number of style-branches (as in some early treatments) may prove to be misleading. *E. limosa* was based on a collection by *Hesse.*

132. E. BARONI Baker (PL. 539, FIG. 8). Culms densely cespitose, pale green, striate, often twisted, 1.5–2.0 dm. high, 0.5 mm. wide: sheaths truncate or oblique at the apex: spikelets cylindric to lanceolate, acute, 0.7–2.0 cm. long, frequently proliferous: *scales dark purplish-brown with low green keel:* stamens 3 (or 2): style 3 (or 2)-fid: achene 1.7 mm. long, narrowly obovate, *trigonous* with costulate angles, yellow, smooth: style-base pyramidal, pale gray, ⅓–¼ as long as the achene-body; *bristles rudimentary or lacking.*—Journ. Linn. Soc. xx. 297 (1883); Chermezon, Bull. Soc. Bot. France, ser. 5, iv. 287 (1928), and Cat. Cyp. Madagascar 36 (1931).—MADAGASCAR:

Maps 64–73. Map of Eleocharis, 64, palustris (North America); 65, calva; 66, Smallii; 67–73, races of macrostachya: 67, distribution of the species; 68, Uinta acuminata; 69, Texas perlonga; 70, xyridiformis, including Missouri spiral phase; 71, Missouri soft compressed; 72, California perlonga; 73, Oregon black-scaled.

Ankaratra, 2000 m., *Perrier de la Bâthie* no. 13307 (B); Central Madagascar, *Baron* no. 2076 (TYPE, K). *E. limosa* sensu Clarke in Durand & Schinz, Consp. Fl. Afr. v. 598 (1895) (in part), not (Schrader) Schultes.

The type of *E. Baroni* being very young, I have described achenes from *P. de la Bâthie* no. 13307. There is some possibility that the type of *E. Baroni* actually belongs under *E. limosa*, which also grows in Madagascar. Chermezon (l. c., p. 287) has clearly differentiated *E. Baroni*, which is a slenderer plant with smaller spikelets, short scales which are definitely keeled, and achenes without bristles.

133. E. CARNIOLICA C. Koch (PL. 546, FIG. 3). Cespitose perennial, with a soft caudex or abbreviated rhizome; culms 0.5–3 dm. long, filiform to somewhat spongy, striate: sheaths stramineous or lightly brown-tinged, the apex oblique and somewhat acuminate: *spikelets often proliferous*, oblong-lanceolate, in age sometimes becoming ovate, 3–13 mm. long, acute: scales ovate, obtuse to subacute, not obviously keeled, green with brownish sides: stamens 2 (rarely 3), anthers 0.5 mm. long; *style 2-fid: achenes obovate-lenticular*, 1.5 mm. long, olive to yellowish green, lightly striolate, narrowed at the apex into an obvious neck: style-base flattened, elongate-conic, gray, $\frac{1}{4}$–$\frac{1}{3}$ as wide as the achene: bristles pale brown, slightly exceeding the achene.—Syn. Fl. Germ. ed. 2, 853 (1844); C. B. Clarke, Journ. Bot. XXV. 269 (1887); Parlatore, Fl. Italiana ii. 66 (1852); Boeckl. Linnaea xxxvi. 435 (1869–70); Hegi, Ill. Fl. Mitteleurop. ii. 42, fig. 199 (1908); Javorka, Icon. Fl. Hung. fig. 470 (1929). *Scirpus gracilis* Salzm. ex Rchb. Ic. viii. 37, fig. 698 (1846). *Eleocharis Bartoliana* De Notaris, Ind. Sem. Hort. Genuens. 24 (1848); Steudel (as *E. Bartoloniana*), Syn. Cyp. 80 (1855). *Scirpus carniolicus* Thomé, Fl. Deutsch. i. 259 (1903); Aschers. & Graebn. Syn. Mitteleurop. Fl. ii². 304 (1904). "Ab Italia boreali usque ad Hungariam (Pedemonta, Styria, Croatia, Carniola, Dalmatia)" C. B. Clarke (l. c.).

Hegi (l. c.) notes that *E. carniolica* is an infrequent species, easily overlooked, growing on river banks and in wet fields to 1000 m. altitude.

134. E. TETRAQUETRA Nees. MAP 46. Perennial with a descending rootstock, sometimes with short lateral stolons; culms 3–7 dm. high, *quadrangular* with prominent angles; sheaths stramineous to purplish, the oblique apex brown-margined, with a prominent mucro: spikelets many-flowered, oblong-ellipsoid, obtuse to acute, 1.0–1.5 cm. long; scales subcoriaceous, closely appressed when young, in age becoming somewhat spreading, obtuse, not keeled, castaneous with a ferruginous hyaline margin: stamens 3, anthers 1.0 mm. long: style 3-fid: achene obovate, trigonous (often nearly lenticular), the outer angle obtuse, shining, yellowish-green, lightly striolate-reticulate; *style-base*

submitriform, trigonous to flattened, acute, ½ as long as the achene-body; *bristles deep brown, equalling the achene, densely covered by elongated reflexed teeth.*—Nees in Wight, Contrib. 113 (1834); Kunth, Enum. ii. 150 (1837); Boeckl. Linnaea xxxvi. 447 (1869–70); Benth. & Muell. Fl. Austral. vii. 294 (1878); C. B. Clarke in Hook. f. Fl. Br. Ind. vi. 630 (1893), Journ. Linn. Soc. xxxvi. 229 (1903), and Ill. Cyp. t. xxxvii, fig. 17–20 (1909); Koorders, Excurs.-Fl. Java, fig. 247 (1922); Merrill, Enum. Phil. Pl. i. 121 (1922); C. E. C. Fischer, Fl. Presidency Madras 1647 (1931). *Limnochloa tetraquetra* Nees in Wight, Contrib. 113 (1834) (as synonym). *E. erythrochlamys* Miq. Fl. Ind. Batav. iii. 300 (1855). *E. Wichurai* Boeckl. Linnaea xxxvi. 448 (1869–70). *Scirpus hakonensis* Franch. & Sav. Enum. Pl. Jap. ii. 110 (1879), and *S. Onaei* (op. cit.), p. 544. *E. liukiuensis* Makino, Tokyo Bot. Mag. xviii. 111 (1904), e descr.—Australia to eastern Asia. AUSTRALIA: Richmond River, *Miss Hodgkinson* (K). SUMATRA: Asahan, *Bartlett* nos. 7357 (G), 8074 (G). PHILIPPINE IDS.: Benguet, Luzon, *Merrill* no. 1762 (G, NY). INDIA: Sikkim, 6–12,000 ft., *Hooker f.* (G); Mont Khasia 4000 ft., *Hooker* & *Thomson* (G). CEYLON: *Thwaites* no. 2397 (G). CHINA: Tapu District, Kwangtung, *Tsang* no. 21278 (NY); Lao Shan, Shantung, *Chiao* no. 2816 (NY); Nanking, *Ching* no. 8975 (G); Canton, *Levine* no. 1410 (G); Hupeh, *Henry* no. 4232 (G); Kinkiang, Kiangsi, 800 ft., *Allison* no. 10 (G). JAPAN: vic. Kobe, *Uno* nos. 6377 (G), 13059 (G); Wakayama, *Uno* no. 6402 (G); Musashi, *Sakuraj* no. 46 (G). SIBERIA: fl. Bureja, Austro-Ussuria, *Komarov* no. 246 (G).

The specimens from Japan belong to var. *Wichurai* (Boeckl.) Makino, Native Fl. Japan 738 (1925) (sub fig.), characterized by softer culms and membranous scales. Some additional stations (from the cited bibliography) are mapped in addition to specimens actually examined.

135. E. LAEVISETA Nakai (PL. 546, FIG. 4). *E. pellucidae* simili, sed multo robustiori; perenni (?) caudice suberecto; culmis 15–25 cm. longis, circa 0.5 mm. latis, leviter sulcatis; vaginis stramineis ad basin purpurascentibus, apice paullo inflato, annulo obliquo tumido atro-brunneo cincto, mucrone 0.5 mm. longo instructo: spiculis multifloris, brunneis, 6–10 mm. longis, ovatis vel paullo elongatis, obtusis: squamis obtusis, haud carinatis, dorso cretaceo, lateris brunneo vel castaneo: staminibus 3: stylo 3-fido: achaenio 1.4 mm. longo, obovato, trigono, olivaceo-brunnescente, laeve vel leviter striato: *stylobasi trigoni-mitriformi*, in apice acuto, *angulis decurrentibus*, concolore; *setis* cinnamomeis, achenium aequante, *laevibus*.—Nakai in Mori, Enum. Pl. Cor. 71 (1922), nomen.—KOREA: Prov. Zennan, Isl. Wang-to, *T. Nakai* no. 575, June 20, 1913. TYPE in Herb. Univ. Tokio; COTYPE in herb. Brooklyn Bot. Garden.

Dr. Nakai has kindly sent me an example of this species, which differs from *E. pellucida* primarily in the very broad style-base. It is

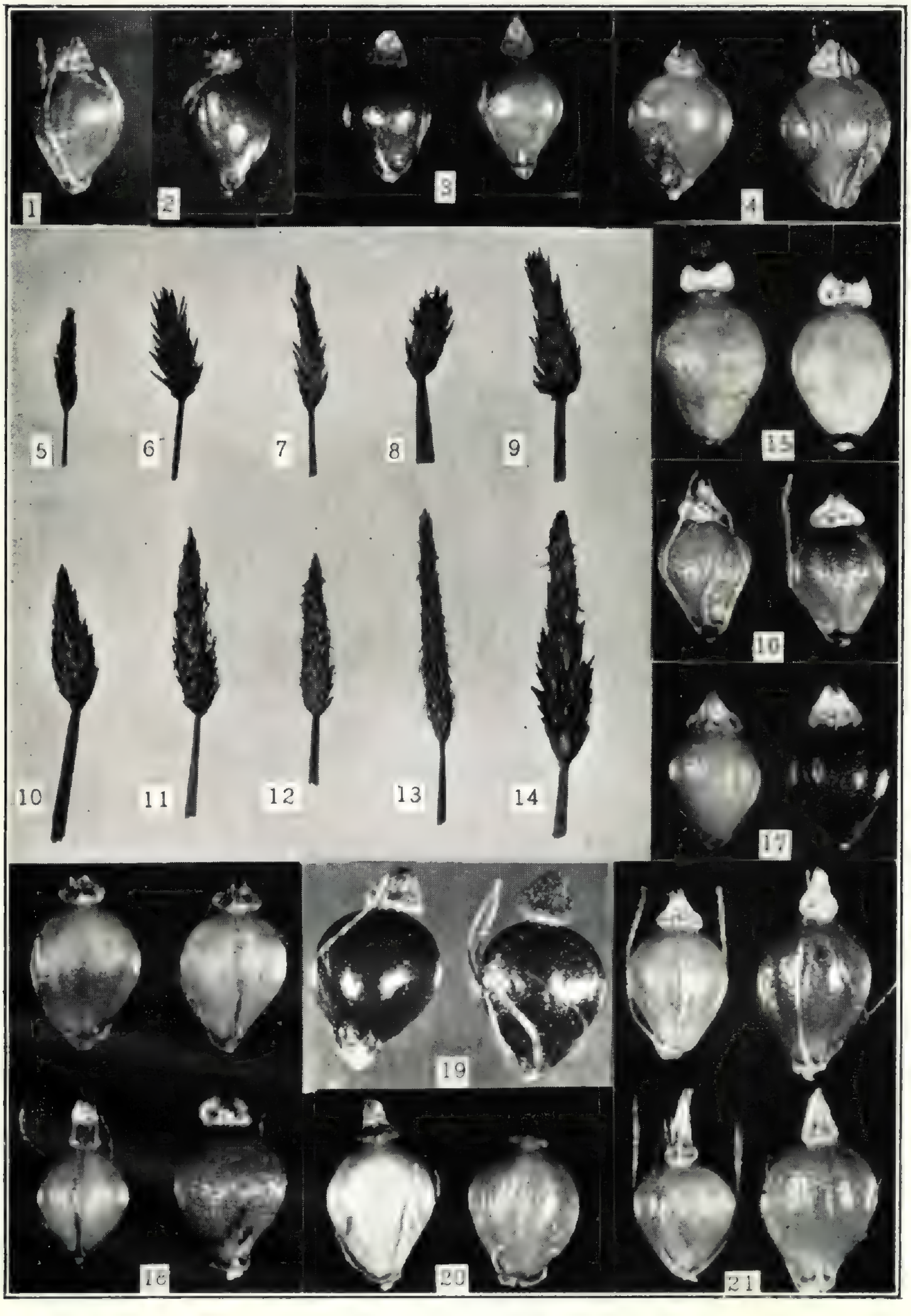


Photo. L. Buhle

ELEOCHARIS (PALUSTRES) (spikelets × ⅔; achenes × 10). FIGS. 1, 5, E. CALVA. 2, 6, E. SMALLII. 3, 7, E. MACROSTACHYA (TYPE). 4, 8, E. MAMILLATA. 9, 21, E. PALUSTRIS (Nova Scotia). 10, 15, E. PALUSTRIS (Montana). 11, 20, E. MACROSTACHYA (Uinta Mts.). 12, 16, E. XYRIDIFORMIS. 13, 17, E. MACROSTACHYA (Texas). 14, 19, E. PALUSTRIS (Oregon). 18, E. MACROSTACHYA (Wyoming).

possibly the same as *H. Maximowiczii* Zinserling, Fl. U.S.S.R. iii, 588, t. vii, fig. 1 (1935) from the Amur region, and *Scirpus japonicus* (Miq.) Fr. & Savat. var. *thermalis* Hultén, Fl. Kamtschatka i. 165, t. 5e (1928). The smooth character of the bristles is of minor importance.

136. E. PELLUCIDA Presl. Annual or perennial (?) by a short rootstock, culms capillary to filiform, frequently spongy or flaccid, 0.5–4 dm. long, striate to lightly sulcate: sheaths often purplish at base, the apex oblique, often inflated or truncate and with a prominent mucro: spikelets frequently proliferous, ovoid to ovoid-cylindric, acute, many-flowered, 4–8 mm. long: scales ovate-oblong, obtuse to subacute, scarcely keeled, pellucid to opaque light green, or chestnut, with a hyaline border; the lowest larger, semi-erect, and dark opaque green: stamens 2 (rarely 3), anthers 0.5 mm. long: style 3-fid: achenes 1.0–1.5 mm. long, trigonous, narrowly obovate, olive to yellowish-green, lightly striolate; style-base trigonous, gray, acuminate, 3-lobed at the base, much narrower than the achene; bristles light brown, usually exceeding the achene.—Rel. Haenk. i. 196 (1830); Steud. Syn. Cyp. 80 (1855); Miq. Fl. Ind. Batav. iii. 301 (1855); Handel-Mazetti, Symb. Sinicae vii. 1250 (1936). *E. afflata* Steud. in Zoll. Verz. Ind. Archip. 62 (1854), and Syn. Cyp. 76 (1855); Miq. Fl. Ind. Batav. iii. 299 (1855); C. B. Clarke, Journ. Linn. Soc. xxxvi. 226 (1903); Camus in Lecomte, Fl. Indo-Chine vii. 87, fig. 13 (1912); Merrill, Enum. Phil. Pl. i. 119 (1925). *E. japonica* Miq. Ann. Mus. Lugd. Bot. ii. 142 (1865). *E. subprolifera* Steud. Syn. Cyp. 80 (1855); Miq. (op. cit.) 300 (1855); Boeckl. Linnaea xxxvi. 426 (1869–70); Koorders, Exkurs.-Fl. Java, fig. 246 (1922). *Scirpus afflatus* Benth. Fl. Hongk. 394 (1861). *E. subvivipara* Boeckl. Linnaea xxxvi. 424 (1869–70); C. B. Clarke in Hook. Fl. Br. Ind. vi. 629 (1893) and Ill. Cyp. t. xxxvii. figs. 13–16 (1908). *E. Thompsoni* Boeckl., Linnaea xxxvi. 451 (1869–70). *E. chlorocarpa* Boeckl. Flora lxi. 34 (1878). *Scirpus japonicus* Fr. & Savat. Enum. Pl. Jap. ii. 109 (1879). *S. attenuatus* Fr. & Savat. (op. cit.) 543 (1879). *E. Kuntzei* Boeckl. Cyp. Nov. i. 14 (1888). *E. Ga[m]bleana* Boeckl. Allg. Bot. Zeit. 1896. 54 (1896). *E. nipponica* Makino, Tokyo Bot. Mag. xviii. 110 (1904), e descr. *E. Shimadai* Hayata, Ic. Pl. Formos. vi. 107, fig. 24 (1916). *E. Chaetaria* var. *vivipara* (Boeckl.) Fischer, Fl. Presidency Madras 1648 (1931).—Southeastern Asia to Borneo and the Philippines. From numerous specimens the following are cited: CHINA: Fukien Prov., *Ching* nos. 6833 (NY), 6603 (NY), 6482 (NY), 6573 (NY). FORMOSA: *Faurie* in 1914 (G). JAPAN: Waseda, Musashi, *Watanabe* in 1890 (G). KOREA: fl. Yalu, *Komarov* no. 245 (G). INDIA: *Hooker & Thomson*, Mont. Khasia, 0–4000 ft. (G) (COTYPE of *E. Thompsoni* and *E. ochrostachys* Boeckl. (partim)). INDO-CHINA: Tonkin, *Balansa* no. 218 (K). JAVA: in oryzetis, *Zollinger* (TYPE (Paris) of *E. afflata*) (small flowering plant 10 cm. high).

E. pellucida seems to be the earliest name for the small ubiquitous plants of southeastern Asia, frequently proliferous, and with smooth trigonous achenes. The type from Luzon, evidently is the small phase similar to the type of *E. afflata* of Java and to *E. Thomsoni* of eastern India, in which the achenes average 1.0 mm. long. These, I believe, pass directly into the larger plants with achenes often 1.5 mm. long, such as *Scirpus attenuatus* Fr. & Sav., Boeckeler's (not Steudel's) *E. ochrostachys*, and a similar collection (*Faurie* in 1914) from Formosa; and probably into the compact, rigid, thick-culmed plants, chiefly of western India, known as *E. congesta*.

137. E. CONGESTA D. Don [PL. 546, FIG. 2], Prodr. Fl. Nepal 41 (1825); Kunth, Enum. ii. 152 (1837); C. B. Clarke in Hook. f., Fl. Br. Ind. vi, 630 (1893); Camus in Lecomte, Fl. Indo-Chine vii. 88 (1912); C. E. C. Fischer, Fl. Presidency Madras 1648 (1931). *E. purpurascens* Boeckl. Linnaea xxxvi. 455 (1869–70).

Similar to *E. pellucida*, but with thicker, rigid culms. Hooker (l.c.) considers it as perhaps only a western variety of *E. afflata*, and states that it occurs throughout India (alt. 3000–6500 ft.) except Bengal. The illustration is from Tehri Garwahl, Western Himalaya, *Dudgeon & Kenoyer* no. 129 (B).

138. E. CYLINDROSTACHYS[1] Boeckl. [PL. 537, FIG. 7) Flora lviii. 108 (1875); Benth. & Mueller, Fl. Austral. vii. 294 (1878); Bailey, Queensland Fl. 1755 (1902).—QUEENSLAND: muddy creek bank, Lawnton, near Brisbane, *S. T. Blake* no. 1145 (B).

139. E. ACUTA R. Br. [PL. 538, FIG. 2] Prod. 224 (1810); Benth. & Mueller, Fl. Austral. vii. 294 (1878); Bailey, Queensland Fl. 1755 (1902); Rodway, Tasmanian Fl. 241 (1903); Cheeseman, Man. N. Zealand Fl. 768 (1906); Black, Fl. South Austral. 91 (1922); Ewart. Fl. Victoria 223 (1930). *E. marginulata* Nees, Ann. & Mag. Nat. Hist. vi. 46 (1841); Steudel, Syn. Cyp. 82 (1855). *E. mucronulata* Boeckl. Linnaea xxxvi. 466 (1869–70).—TASMANIA: Derwent River, *R. Brown* no. 5933, Mar.–Apr. 1804 (TYPE, Br. Mus.) (K); New Norfolk, *Gunn* no. 573 (K). NEW SOUTH WALES: Tharwa, Federal Terr., *S. T. Blake* no. 7539 (B); New England, *C. Stuart* (K); Armidale, *Perrott* (K); Centennial Park, *Kneucker* no. 192 (NY) (as *E. marginulata*). VICTORIA: *Harvey* in 1854 (G); Port Philip, *Mueller* (G). NEW ZEALAND: Tuamarina, *Dr. Haast* in 1866 (K); Bay of Islands, *Wilkes Exped.*

[1] The Australian species of *Eleocharis* are being treated in detail by Mr. S. T. Blake of the University of Queensland, and I have therefore not found it necessary to describe them. However, for a uniform treatment of the groups, I have included illustrations of Australian plants [cf. pl. 538, including figs. 3, 6] with sufficient bibliographic references to account for the nomenclature now in use. And, as a final word, my acknowledgment is expressed for the generosity and cooperation of Mr. Blake, who has placed both notes and specimens at my disposal.

(G, K); Aukland, *Leland, Chase* & *Tilden* no. 217 (G, NY); Miramar, North Island, *Kirk* no. 187 (G). NORFOLK ISLAND: *Maiden* & *Boorman* in 1902 (K).

var. PALLENS[1] Benth. & Mueller [PL. 538, FIG. 1], Fl. Austral. vii. 295 (1878).—QUEENSLAND: Offham, Warrego District, *S. T. Blake* no. 11235 (B); Mitchell Distr. *Blake* nos. 10361 (B), 11607 (B). NEW SOUTH WALES: Mt. Murchison, *Dallachy* & *Goodwin* (Br. Mus., NY).

140. E. DIETRICHIANA Boeckl. [PL. 538, FIG. 5], Flora lviii. 107 (1875).—QUEENSLAND: edge of fresh-water swamps, Rockhampton, *S. T. Blake* no. 12738 (B).

Boeckeler's type, which came from Rockhampton, was described as having olivaceous, obovate achenes, cuneate-attentuate at base and slightly constricted at the apex.

141. E. CUNNINGHAMII Boeckl. Perennial from a ligneous, often thickened, rootstock; culms filiform, 0.5–4 dm. high, irregularly sulcate: sheaths loose, oblique, often purplish, acute to acuminate at the apex: spikelets ovate to lanceolate-oblong, 3–20-flowered: scales obtuse to subacute, membranous, castaneous to purplish: style 3-fid: achene obscurely to prominently trigonous, obovate-pyriform, 1.5 mm. long, green to yellowish-brown, lightly striolate-punctulate: style-base pyramidal, acute; bristles usually exceeding achene.—Flora xli. 412 (1858) and Linnaea xxxvi. 427 (1869–70); Cheeseman, Man. N. Z. Fl. 769 (1906). *E. gracilis* vars. *gracillima* and *radicans* Hook. f. Fl. N. Z. i. 270 (1853) and Handb. N. Z. Fl. 301 (1867). *E. gracillima* Hook. f. Handb. N. Z. Fl. 745 (1867). *H. Hookeri* Boeckl. Linnaea xxxvi. 430 (1869–70). *E. multicaulis* Benth. & Muell. Fl. Austral. vii. 295 (1878). NEW ZEALAND: Bay of Islands, *R. Cunningham* (K) and *Wilkes Exped.* (G); Aukland, *Cheeseman* (K) and *Kirk* no. 14 (G); Papakura, North Island, *Kirk* no. 178 (G); *Cunningham* no. 270 (K).

This variable plant [cf. Cheeseman, l. c.] is exceedingly close to *E. multicaulis* from which it differs chiefly in the slender character of the culm, smaller spikelets, and generally smaller achenes. By Bentham & Mueller (l. c.) it was placed under *E. multicaulis*, which may well be the correct disposal of the species. If so, it has undergone a considerable amount of change in external appearance since its introduction into New Zealand. If it is not a native species, the introduction must have occurred at a very early date, thus a note by C. B. Clarke (?) accompanying one of Kirk's specimen at Kew: "It is the *E. acicularis* of Mr. Richards, and in all probability was collected by d'Urville on his first voyage (1822) but even if not collected until his second voyage (1827) could scarcely have been introduced into Banks Peninsula at

[1] Var. *platylepis* Hook. f. Handb. N. Z. Fl. 745 (1867), quite distinct from var. *pallens*, appears to be of little consequence.

that time as suggested by Bentham." Since *Scirpus cernuus* and allied species were collected as *Eleocharis acicularis* by early explorers, it is difficult in the absence of specimens, to say exactly what species might have been involved.

Geographical Distribution of Series Multicaules

This series, under which I have included all the Old World species with 3-fid styles (except the *Mutatae* and *Tenuissimae*), is perhaps not so homogeneous as the other groups. *E. multicaulis* is an "Atlantic" species of Western Europe, centering about the Mediterranean and very close to *E. marginulata*, of the mountains of Abyssinia and Equatorial Africa, which is in turn allied to *E. limosa* and *E. Baroni* of South Africa and Madagascar. In Australia the species corresponding to *E. limosa* seems to be *E. acuta*, with which are associated *E. cylindrostachys* and *E. Dietrichiana*. In New Zealand there is a single species, *E. Cunninghamii*, which is so close to *E. multicaulis* that it might perhaps be considered as a dwarfed and slender variant of that species. Characteristic of southeastern Asia and the larger islands is *E. tetraquetra*, which apparently runs into annual forms toward the northern limit of range. The most widespread and variable species of the group is *E. pellucida* (*E. afflata*), concentrated in southeastern Asia, associated with two doubtfully distinct species (*E. congesta* and *E. laeviseta*), and evidently the source of *E. carniolica* of eastern Europe.

Species of Uncertain Classification

142. E. minarum Boeckl. (pl. 545, fig. 1). Perennial, with thickened vertical rootstocks; culms numerous, filiform, 30–35 cm. high (sometimes proliferous), 4-angled, deeply sulcate, punctate: sheaths purplish-brown below, stramineous above; the oblique apex firm, brown-margined, incurved, with an obscure mucro: spikelets subacute, 5–7 mm. long, 12–15 flowered: scales chartaceous, firm, ovate-lanceolate, obtuse to subacute, brown, scarcely keeled, with yellowish midrib and erose margin, lowest scale larger, greenish, erect, as though a continuation of the culm: style 3-fid.—Cyp. Nov. ii. 12 (1890); Lindman, K. Sv. Akad. Hand. Bihang 26, Afd. 3, no. 9: 13, t. 2, fig. 3 (1900).

I have seen the type collected in Minas Geraes, Brazil, by *Widgren* in 1845 (Stockholm), and also the cotype at Copenhagen. *E. minarum*, probably related to *E. dunensis* and *E. viridans* of the Uruguay coast, should never have been described from such immature material.

143. E. melanocarpa Torr.; Svenson, Rhodora xxxix. 269 (1937).

144. E. albida Torr.; Svenson, Rhodora xxxix. 271 (1937).

145. E. SQUAMIGERA Svenson, RHODORA xxxvi. 389 (1934).

146. E. SUBARTICULATA (Nees) Boeckl. MAP 37. Culms from an elongate cord-like rootstock; when sterile usually solitary, spongy and thickened, (1–2 mm. wide) often roughened by short interrupted septae (tuberculato-septatis), the fertile culms fascicular, filiform and opaque, 5–15 cm. high: sheaths stramineous to purple, the subinflated apex usually obtuse, purple-spotted, without a mucro: spikelets *fusiform* to lanceolate, acute to *acuminate*, 4–10 mm. long, 15–25-flowered: scales obtuse to subacute, obscurely keeled, greenish-castaneous with a purplish border: stamens 3, anthers 0.7 mm. long: style 3-fid: achene trigonous to almost planoconvex, narrowly obovate, shining olivaceous, deeply reticulate: style-base narrow, subulate, gray, 1/3–1/4 as long as the achene-body: bristles light brown, shorter than or exceeding the achene.—Linnaea xxxvi. 455 (1869–70); not Lindman, K. Sv. Vet. Akad. Hand. Bihang. xxvi, Afd. 3, no. 9: t. 2, fig. 2 (1900). *Chaetocyperus subarticulatus* Nees in Martius, Fl. Bras. ii[1]. 96 (1842); Steud. Syn. Cyp. 74 (1855). *E. Widgrenii* Boeckl. in Engler, Bot. Jahrb. v. 503 (1884); Lindman (l. c.) 13, t. 2, fig. 6 (1900). *H. Usterii* Palla, Fl. São Paulo 158 (1911).—BRAZIL: sine loc., *Sellow* (Berlin, TYPE) (young flaccid plants without achenes). MINAS GERAES: Caldas, *Widgren* (Berlin, TYPE of *E. Widgrenii*) and *Widgren* in 1845 (S, US). RIO DE JANEIRO: *Andersson* in 1851 (S); Theresapolis, Serra dos Orgãos, *Schenck* (Berlin). SAO PAULO: Avenida Paulista, *Hoehne* no. 9158 (G) (as *H. Usterii*).

The relationship is obscure. The achenes resemble those of *E. intermedia* (Muhl.) R. & S.; and to some extent, those of *E. nodulosa* var. *angulata*.

ELEOCHARIS. INDEX TO SPECIES.

Names of recognized species are in bold front; other names are considered as synonyms. An exclamation point preceding the name indicates that I have seen the type or a cotype. A large number of species of *Palustres* have been recently described by Zinserling from Europe and Asia; these names and some previously published *Palustres* have been omitted from the index but will be found on pp. 55–65. A few determinations in the index are taken from Index Kewensis. Figures following the names refer to the present [species numbers in bold front] and previous papers on *Eleocharis*:[1]

i. RHODORA xxxi. (1929); Gray Herb. Contrib. no. lxxxvi.
ii. RHODORA xxxiv. (1932); Brooklyn Bot. Gard. Contrib. no. 65.

[1] ERRATA: i. [1929]. For "orbicular" in Key; lines "c" p. 129, and "m" p. 130, read "obovate."
iv. [1937]. In legend accompanying plates 463–465, delete "Tenuissimae."

iii. Rhodora xxxvi. (1934); Brooklyn Bot. Gard. Contrib. no. 68.
iv. Rhodora xxxix. (1937); Brooklyn Bot. Gard. Contrib. no. 77.

! **acicularis 36**
! acicula riformis = bonariensis 28
acuminata = nom. obscurum (iv. 217)
! **acuta 139**
acutangula = fistulosa 1
! **acutisquamata 74**
affinis = uniglumis 68
! afflata = pellucida 136
! **albibracteata 85**
! **albida 144**
albivaginata = flavescens 51
alta (?) (i. 162)
! **alveolata 105**
! **amazonica 98**
! ambigua = acuta 139
! **ambigens 66**
! amphibia = bonariensis 28
! **anceps 117**
andina = melanostachys 60
andesica = nodulosa 87
! appendiculata = melanostachys 60
! arcuata = fuscopurpurea 43
Arechavaletae = Sellowiana 48
! arenaria = glauca 104
! arenicola = montevidensis 86
argyrolepis = palustris (K. I)
! articulata = interstincta 11
atacamensis = pauciflora 20
! **atropurpurea 46**
! atricha = acicularis (?) 36
aurea = (?) iv. 220

Baeothryon = nom. obscurum (cf. 64)
Balansaiana = filiculmis 123
! **Baldwinii 106**
bahamensis 45
! **Baroni 132**
! **Barrosii 96**
Bartoliana = carniolica 133
! **bella 33**
benedicta = palustris 56
! Berlandieri = albida 144
! Bermudiana = albida 144
! bicolor = minima 94
biocreata = flavescens (?) 51
biseptata = sphacelata 14
! bivaginata = Dombeyana 82
! **Bolanderi 76**
! **bonariensis 28**
! **brachycarpa 31**
! **Brainii 114**
brasiliensis = elongata (?) 16
! Brehmeriana = crinalis 83
! Brittonii = microcarpa 102
brizantha = geniculata (?) 53

! caduca = geniculata 53
! **caespitosissima 116**
calocarpa 9
! calyptrata = filiculmis 123
! **calva 64**
! camptotricha = nana 97
! **cancellata 32**
! **capillacea 47**
! capitata = geniculata 53
caribaea = geniculata 53
carniolica 133
! carolina = nigrescens 100
! **cellulosa 5**
! **Chaetaria 113**
chlorocarpa = pellucida 136
! chrysocarpa = nodulosa 87
cognata = interstincta 11
comosa = acicularis 36
! compacta = spiralis 10
! complanata = nigrescens 100
! **compressa 72**
confervoides = Scirpus c.
congesta 137
conica = uniglumis 68
constricta = elegans 89
! contracta = nodulosa (iv. 258)
! consanguinea = nodulosa 87
! costaricensis = filiculmis 123
costata = acicularis 36
! costulata = radicans 27
crassa = palustris 56
crassiculmis = elegans 89
! **crinalis 83**
crispovaginata = Sellowiana 48
! cubensis = microcarpa 102
! **Cunninghamii 141**
! Curtissii = vivipara 107
! **cylindrica 75a**
cylindrostachys 138

! **debilis 44**
! **decumbens 78**
! depauperata = retroflexa 103
! **densa 89a**
densesquamata = elegans 89
! diandra = ovata 39
Dietrichiana 140
! disciformis = Parishii 79
! dispar = geniculata 53
! **Dombeyana 82**
! **Dregeana 61**
! dubia = pachycarpa 128

dulcis 13
! **dunensis 126**
Durandii = minima 94
! Dussiana = flavescens 51

! Ekmanii = Sintenisii 52
! elata = plicarhachis 19
! **elegans 89**
Elliottii = equisetoides 12
! **elliptica 70**
! **elongata 16**
emarginata = quinquangularis (?) 122
! **Engelmanni 40**
! equisetina = dulcis 13
! **equisetoides 12**
erratica = atropurpurea 46
erythrochlamys = tetraquetra 134
! erythropoda = calva 64
! **exigua 26**
exilis = Schaffneri 49
! **fallax 66a**
fennica = uniglumis 68

! **filiculmis 123**
! filiformis = tenuis 71
fistulosa 1
! flaccida = flavescens 51
! **flavescens 51**
funebris = melanostachys 60
! **fuscopurpurea 43**
fusco-sanguinea = pachycarpa 128
Gableana = pellucida 136

! galapagensis = Sellowiana 48
! **geniculata 53**
! **glauca 104**
! **glauco-virens 124**
! glaucescens = palustris 56
! Glazioviana = maculosa 42
Glehni = kamtschatica (?) 69
! gracilis = multicaulis 129
! gracillima = Cunninghamii 141
Graeffeana = laxiflora 7
! grandis = nudipes 120
! **grisea 109**
haematolepis = nodulosa 87
! halmaturina = not Eleocharis
! **halophila 67**
Haumaniana 93
Helenae = Schweinfurthiana (?) 115
! Hildebrandtii = nigrescens 100
homonyma = Sellowiana (i. 234)
! Hookeri = Cunninghamii 141
hyalinovaginata = fuscopurpurea 43

! **intermedia 80**
! **interstincta 11**
! **intricata 55**

! Jamesonii = minima 94
japonica = pellucida 136
! **Jelskiana 18**

kamtschatica 69
! Kirkii = geniculata (iv. 254)

! laetevirens = flavescens (?) 51
! **laeviseta 135**
! **lanceolata 41**
! **laxiflora 7**
Lechleri 90
Lehmanni = palustris 56
! Lehmanniana = maculosa 42
! **Loefgreniana 125**
lepida = pachycarpa 128
! lepta = (?) Eleocharis (iv. 254)
! leptocaulis = pachycarpa 128
! leptostachys = Loefgreniana 125
! Lereschii = atropurpurea 46
! leucocarpa = subfoliata 108
! Lindheimeri = radicans 27
Liebmanniana = urceolata 95
! **limosa 131**
liocarpa = pachycarpa 128
! litoralis = melanostachys 60
liukiuensis = tetraquetra 134

! **Macounii 81**
! macra = debilis 44
macrantha 21 (i. 177)
! macrorhiza = melanostachys 60
! **macrostachya 58**
! **maculosa 42**
! madagascariensis = intricata 55
! **margaritacea 22** (iii. 386)
! **marginulata 130**
media = fistulosa 1
! **melanocarpa 143**
! melanocephala = albibracteata 85
! **melanomphala 25**
melanosperma = geniculata (?) 53
! **melanostachys 60**
mendocina 91
! Mendoncae = maculosa 42
mesopotamica = Sellowiana 48
mexicana = elegans 89
! **microcarpa 102**
! microformis = geniculata 53
! **minarum 142**
minor = palustris 56
! **minima 94**
! **minuta 54**

! minutiflora = nigrescens 100
! **minutissima 110**
! **mitracarpa 62**
! **mitrata 17**
! monandra = atropurpurea 46
! montana = nodulosa 87
! **montevidensis 86**
! monticola = Engelmanni 40
mucronulata = acuta 139
Muhlenbergiana = n. obscur. (cf. 64)
multicaulis 129
! multiflora = atropurpurea 46
mutata 4

! **nana 97**
Naumanniana 119
nebrodensis = palustris 56
! **neo-zealandica 59**
! **nervata 30**
! nervosa = ambigens (?) 66
Niederleinii = viridans (?) 127
! **nigrescens 100**
nipponica = pellucida 136
! **nitida 73**
nodulosa 87
! nubigena = albibracteata 85
! **nudipes 120**
! **nuda 8**
! **nupeensis 2**

obsoleta = interstincta 11
obtusa 38
obtusangula (nom. nudum)
! obtusetrigona = fistulosa (i. 161)
ocreata = flavescens (i. 277)
! ochrostachys = laxiflora 7
! **olivacea 50**
! **oligantha 99**
! oropuchensis = minima 94
ovata 39
oxyneura = bonariensis 28

! **pachycarpa 128**
! **pachystyla 121**
! pallida = Scirpus cespitosus
! **Palmeri 77**
! **palustris 56**
! paracicularis = nigrescens 100
! **Parishii 79**
Parodii 88
parvula 23
! **pauciflora 20**
pellucida 136
! perlonga = macrostachya 58
! Perrieri = nigrescens 100
! philippinensis = nuda 8
! pileata = kamtschatica 69
Pittieri = flavescens (?) 51
! planiculmis = fistulosa 1
! plantaginea = dulcis 13
! plantaginoides = dulcis 13
! platypus = rostellata (iii. 384)
! **plicarhachis 19**
polycaula = palustris 56
! praticola = flavescens 51
! prolifera = nom. conf. (iv. 241)
! punctata = nana 97
purpurascens = congesta 137
purpureo-vaginata = filiculmis 123
! **pusilla 37**
! pygmaea = parvula 23
! **quadrangulata 3**
! **quinquangularis 122**

! **Rabenii 84**
! **radicans 27**
! Ravenelii = nodulosa 87
recurvata = Chaetaria 113
! reclinata = intermedia 80
! **retroflexa 103**
! **Reverchonii** 34
! riparia = geniculata 53
! rivularis = exigua 26
! **Robbinsii 15**
Rothiana = filiculmis 123
! **rostellata 24**

! Sagotii = Jelskiana 18
! Salzmanniana = Sellowiana 48
! savannarum = minima 94
! **Savatieri 63**
! scariosa = mutata 4
! **Schaffneri 49**
! Schlechteri = ?geniculata (iv. 255)
! Schottiana = maculosa 42
! **Schweinfurthiana 115**
! **Sellowiana 48**
septata = interstincta 11
! setacea = geniculata 53
! Shaferi = Sintenisii 52
Shimadai = pellucida 136
! Sieberi = variegata 6
! simplex = tuberculosa 112
simulans = melanostachys 60
! **Smallii 65**
! singularis = elegans 89
! **Sintenisii 52**
sororia = limosa 131
spadicea = subfoliata (?) 108
Spegazzinii 92
! **sphacelata 14**
spiralis 10
! squamata = squamigera (?) 145
! **squamigera 145**

! **stenocarpa 29**
! stolonifera = Dombeyana 82
! striata = marginulata 130
! striatula = bonariensis 28
! stylosa = filiculmis (?) 123
! **subarticulata 146**
! **subcancellata 101**
! **subfoliata 108**
submersa = Scirpus confervoides
! subnodulosa = nodulosa 87
subprolifera = pellucida 136
subsphacelata = sphacelata 14
! subtilis = minima 94
subulata = laxiflora 7
subvivipara = caespitossima 116
sulcata = filiculmis 123
sulciculmis = flavescens (?) 51

! **tenuis 71**
tenuissima = minima 94
Testui = Naumanniana 119
tetraquetra 134
! texana = cylindrica 75a
! thermalis = Sellowiana 48
! Thomsoni = pellucida 136
! Torreyana = microcarpa 102
! **tortilis 111**
! trichoides = retroflexa! 103
! **tricostata 75**
! triflora = parvula 23
! **trilophus 118**
truncata = Dombeyana 82
! **tuberculosa 112**
Tuerkheimii = Sellowiana (?) 48
tuberosa = dulcis 13
tumida = dulcis 13

! uncialis = minima 94
! **uniglumis 68**
univaginata = fuscopurpurea 43
! **urceolata 95**

! valdiviana = melanostachys 60
! valida = elegans 89
! **variegata 6**
Vierhapperi = pauciflora 20
! villaricensis = minima var. bicolor!
! vincentina = fuscopurpurea 43
! **viridans 127**
! viridis = elegans 89
! **vivipara 107**
! Vulcani = Dombeyana 82

! Wrightiana = minima 94
Watsoni = uniglumis 68
Wichurai = tetraquetra 134
! Widgrenii = subarticulata 146
! **Wolfii 35**

! xyridiformis = macrostachya 58
! yunquensis = Sintenisii 52
Zanardinii = atropurpurea 46

Chaetocyperus
! niveus = E. retroflexa 103
polymorphus = E. minima 94
! rugulosus = E. retroflexa 103
Isolepis
! ambigua = E. minima 94
aphylla = E. albida 144
! longifolia = E. acicularis var. gracilescens
! monandra = E. atropurpurea 46
Rynchospora monostachya = E. tuberculosa 112
Scirpus
! bahiensis = E. Sellowiana 48
! Gaudichaudianus = flavescens 51
! hakonensis = E. tetraquetra 134
! microlepis = E. nigrescens 100
! nudissimus = E. macrostachya 58
! Onei = E. tetraquetra 134
! spiralis = E. tortilis 111
yokoscensis = E. acicularis (?) 36

Explanation of Plates 537–547

Plate 537. Fig. 1, Eleocharis plicarhachis, Panama, *Svenson* no. 433; 2, E. elongata, Florida, *Nash* no. 944; 3, E. laxiflora, Caroline Islands, *Kanehira* no. 1515; 4, E. variegata, Madagascar, *P. de la Bâthie* no. 14567; 5, E. mitrata, Trinidad, *Crueger;* 6, E. dulcis, Formosa, *A. Henry* no. 1889; 7, E. cylindrostachys, Australia, *Blake* no. 1145; 8, E. calocarpa, Africa, *Hancock & Chandler* no. 21.

Plate 538. Fig. 1, Eleocharis acuta var. pallens, Australia, *Blake* no. no. 11235; 2, E. acuta, Australia, *Blake* no. 7539; 3, E. plana, Australia, *Blake* no. 7615; 4, E. nuda, Australia, *Blake* no. 9360; 5, E. Dietrichiana, Australia, *Blake;* 6, E. Dietrichiana, Gilbert River, Australia, *Brass* in 1931.

Plate 539. Fig. 1, Eleocharis acicularis, Switzerland, *Bernet* in 1861; 2, E. pusilla, Australia, *S. T. Blake;* 3, E. acicularis var. occidentalis,

California, *L. C. Wheeler* no. 2827; 4, E. MELANOMPHALA, Chile, *O. Kuntze* no. 34; 5, E. EXIGUA, Ecuador, *Spruce* no. 5206; 6, E. LIMOSA, Madagascar, *P. de la Bâthie* no. 13570; 7, E. ACICULARIS var. GRACILESCENS, Missouri, *Mackenzie* in 1897; 8, E. BARONI, Madagascar, *P. de la Bâthie* no. 13307; 9, Flowering stage of a) E. RADICANS, b) E. ACICULARIS (Switzerland), c) E. EXIGUA.

PLATE 540. FIG. 1, ELEOCHARIS OBTUSA var. JEJUNA, Massachusetts, *Fernald & Svenson* no. 438; 2, E. ENGELMANNI var. DETONSA, Illinois, *Patterson;* 3, E. DIANDRA, Connecticut, *C. Wright* in 1884; 4, E. OVATA, Vermont, *Brainerd & Eggleston* no. 2140; 5, E. LANCEOLATA, Arkansas, *Coville* in 1887; 6, E. OBTUSA var. GIGANTEA, Washington, *Heller* no. 4073; 7, E. OBTUSA, Massachusetts, *Pl. Exsic. Gray.* no. 136.

PLATE 541. FIG. 1, ELEOCHARIS FLAVESCENS, Porto Rico, *Britton, Britton & Brown,* no. 6728; 2, E. OLIVACEA, New Jersey, *Long* in 1909; 3, E. SINTENISII, Porto Rico, *Sintenis* no. 1220; 4, E. MINUTA, Africa, *Hancock & Chandler* no. 27; 5, E. MINUTA, Madagascar, *P. de la Bâthie* no. 2688; 6, E. SHAFERI, Cuba, *Shafer* no. 3414; 7, E. MADAGASCARIENSIS Madagascar, *P. de la Bâthie* no. 16646; 8, E. MAIDENII, Australia, *S. T. Blake* no. 4724.

PLATE 542. FIG. 1, E. PALUSTRIS, Ramkvilla, Sweden, *Svenson* in 1937; 2, E. PALUSTRIS, Giant's Causeway, Ireland, *Svenson* in 1937; 3, E. MAMILLATA, Haute Saone, France, *Bonati* in 1908; 4, E. UNIGLUMIS Upland, Sweden, *Hülphers* in 1910; 5, E. UNIGLUMIS, Borås, Sweden, *C. Sandberg* in 1926; 6, E. UNIGLUMIS, Halmstad, Sweden, *Ahlfvengren* in 1904; 7, E. MAMILLATA, Finland, *Lindberg* (*Kneucker* no. 158).

PLATE 543. FIG. 1, ELEOCHARIS SAVATIERI, Japan, *Franchet* no. 1384; 2, E. DREGEANA, S. Africa, *Mann* no. 2649; 3, E. LIMOSA, S. Africa, *Burchell* no. 6607; 4, E. DEBILIS, Brazil, *Glaziou* no. 2749; 5, E. MARGINULATA, Africa, *Stolz* no. 1072.

PLATE 544. FIG. 1, ELEOCHARIS NUDIPES, Brazil, *Dusén* no. 2332; 2, E. CRINALIS, Argentina, *Venturi* no. 6192; 3, E. VIRIDANS, Uruguay, *Osten* no. 6907; 4, E. PACHYCARPA, Chile, *Jaffuel* no. 2954; 5, E. DUNENSIS, Uruguay, *Osten* no. 5716.

PLATE 545. ELEOCHARIS (Boeckeler's TYPES from Brazil). FIG. 1, E. MINARUM, *Widgren;* 2, E. GLAZIOVIANA, *Glaziou* no. 2749; 3, E. RABENII, *Raben;* 4, E. URBANI, *Glaziou* no. 17174; 5, E. LEUCOCARPA, *Warming;* 6, E. GLAUCO-VIRENS, *Glaziou* no. 15686; 7, E. LOEFGRENIANA, *Loefgren* no. 146; 8, E. CHRYSOCARPA, *Lund.*

PLATE 546. FIG. 1, ELEOCHARIS MULTICAULIS, England, *Svenson* no. 5851; 2, E. CONGESTA, India, *Dudgeon & Kenoyer* no. 129; 3, E. CARNIOLICA, Czechoslovakia; 4, E. LAEVISETA, Corea, *Nakai* no. 575.

PLATE 547. Achenes (× 10): FIG. 1, ELEOCHARIS CALVA, New York, *Fenno* no. 442; 2, E. SMALLII, New York, *Ferguson* no. 437; 3, E. MACROSTACHYA, Oklahoma (TYPE); 4, E. MAMILLATA, *Finland, Lindberg* no. 158. Spikelets (× ⅔): 5, E. CALVA *Fenno* no. 442; 6, E. SMALLII, *Ferguson* no. 437; 7, E. MACROSTACHYA (type); 8, E. MAMILLATA, *Lindberg* no. 158; 9, E. PALUSTRIS, *Nova Scotia, Fernald & Long* (Pl. Exsic. Gray, no. 437); 10, E. PALUSTRIS, Montana, *Umbach* no. 653; 11, E. MACROSTACHYA, Colorado, *Graham* no. 9691 (Uinta, acuminate phase); 12, E. XYRIDIFORMIS, Arizona, *Clute* no. 125; 13, E. MACROSTACHYA (Texas, acuminate phase) El Paso Co., *Bigelow* in 1852; 14, ? E. PALUSTRIS, Oregon, *Wynd* no. 1111 (Oregon black phase; not uniglumate); 15, E. PALUSTRIS, *Umbach* no. 653; 16, E. XYRIDIFORMIS, *Clute* no. 125; 17, E. MACROSTACHYA, *Bigelow;* 18, E. MACROSTACHYA, Wyoming, *A. Nelson* no. 3764 (4 achenes from same spikelet); 19, E. PALUSTRIS, Oregon, *Wynd* no. 1111; 20, E. MACROSTACHYA (Uinta Mts.), *Graham* no. 9691; 21, E. PALUSTRIS, Nova Scotia, *Pl. Exsic. Gray.* no. 437 (4 achenes from same spikelet).

SOME NOTEWORTHY PLANTS RECENTLY FOUND IN THE COASTAL PLAIN OF MARYLAND AND DELAWARE

A. V. Smith

During several summers of botanizing on the Eastern Shore of Maryland, the writer has discovered new stations for a number of plants of special interest. A few of these plants constitute an extension of range; others are new to the region the rest are somewhat rare. Seventeen of these species are:

Aspidium simulatum Davenport. In swamps near Bethel, Delaware, and Salisbury, Maryland.

Lycopodium alopecuroides L. In low pine lands near Powellville, Maryland.

Isoetes saccharata Engelmann. On river shores near Salisbury and Sharptown, Maryland.

Leptoloma cognatum (Schultes) Chase. In sandy soil near Belltown, Delaware. Also collected south of Hammonton, N. J.

Amphicarpum Purshii Kunth. In low pine lands of Wicomico and Worcester Counties, Maryland.

Paspalum dissectum L. In a shallow stream at Salisbury.

Aristida lanosa Muhl. In sandy soil in Wicomico and Worcester Counties.

Leersia lenticularis Michx. In a swamp between Powellville and Berlin, Maryland.

Psilocarya scirpoides Torr. In wet soil at Salisbury and also at two stations in Sussex County, Delaware.

Rynchospora axillaris (Lam.) Britton. At the edge of a swamp in Salisbury.

Carex glaucescens Ell. In an open pine swamp near Snow Hill, Maryland.

Juncus caesariensis Coville. In a swamp near Glenburnie, Anne Arundel County, Maryland.

Juncus militaris Bigel. Abundant in a stream at Salisbury.

Jussiaea diffusa Forsk. In a pond at Salisbury.

Micranthemum micranthemoides (Nutt.) Wettst. At the edge of a pond near Galestown, Dorchester County, Maryland.

Eupatorium capillifolium (Lam.) Small. In damp soil near Gumboro, Delaware. Common at Salisbury. Also in Worcester County.

Coreopsis rosea Nutt. In wet soil near Galestown.

The five grasses listed above have been examined by Mrs. Chase. The other plants have been examined by Dr. Hugh O'Neill, of this institution.

Langlois Herbarium,
Catholic University of America

Hibiscus palustris L., forma **oculiroseus** (Britton), comb. nov. *H. oculiroseus* Britton in Journ. N. Y. Bot. Gard. iv. 220, pl. 18 (1903).

A striking color-form, appearing frequently with the typical roseate-petaled plant.

The names *Hibiscus palustris* and *H. Moscheutos* L. were simultaneously published for different collections of what seem to be a single species. The latter somewhat unpronounceable name has been long used but the two were apparently first united by Sims in Curtis's Botanical Magazine, xxiii. t. 882 (1806): "Læs deux noms de Linné etant contemporains, le premier auteur qui a établi la synonymie avait le choix entre les deux: c'est le nom qu'il a choisi qui est valable. Nous croyons que c'est Sims (*bot. Mag.* 882) qui a le primier réuni les deux formes en 1806; il a choisi *H. palustris* comme nom de l'espèce collective, il convient donc de conserver cette dénomination."—Hochreutiner in Ann. Conserv. Jard. Bot. Genève, iv. 140 (1900).—M. L. Fernald.

Moss Flora of North America.—Volume 1, part 3 of this comprehensive work[1], has just been issued. It covers three families, namely the Encalyptaceae, Buxbaumiaceae and Pottiaceae, comprising a total of 20 genera and 79 species. The genera are as follows: (Encalyptaceae) *Encalypta;* (Buxbaumiaceae) *Buxbaumia* and *Diphyscium;* (Pottiaceae) *Anoectangium, Aschysma, Astomum, Weisia, Gymnostomum, Eucladium, Rhamphidium, Trichostomum, Timmiella, Pleurochaete, Tortella, Triquetrella, Leptodontium, Hyophila, Barbula, Rhexophyllum* and *Didymodon.* Four new species are described, namely *Buxbaumia subcylindrica* Grout, *Anoectangium arizonicum* Bartr., *Trichostomum spirale* Grout, and *Barbula michiganensis* Steere; while 5 species and 5 varieties are designated by new name-combinations. Sixty-two species are represented by figures, of which 16 are here published for the first time. As in previous parts, the author has had the collaboration of specialists in the treatment of certain groups, the account of the Encalyptaceae being contributed by Dr. Seville Flowers, that of *Tortella* by Mrs. Inez M. Haring, and that of *Didymodon* and *Barbula* by Dr. William C. Steere.—G. E. Nichols.

[1] **Moss Flora of North America north of Mexico, by A. J. Grout. Volume 1, part 3, pp. 137–192, pls. 69–90. October 1938.**

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AQUATIC UTRICULARIAS

GEORGE B. ROSSBACH

A KEY BASED UPON LEAF-CHARACTERS FOR THE AQUATIC UTRICULARIAS OF CENTRAL AND NORTHEASTERN UNITED STATES AND EASTERN CANADA

A. Leaves all whorled.....U. PURPUREA Walt.
A. Leaves chiefly alternate....B.
  B. Foliar divisions terete....C.
    C. Leaves of a single type, usually three or four times, occasionally up to five or six times dichotomous, 2- or less often 3-parted....D.
      D. Leaves three times dichotomous: plants, if flowering, never bearing whorl of inflated petioles....E.
        E. Outline of leaf elliptical, due to pseudopinnate division, basal divisions about .5–.75 mm. in diameter: plant robust, stems about 1 mm. in diameter when dry and mounted, and often somewhat over 1 mm. when fresh and living....U. VULGARIS L.
        E. Outline of leaf circular or slightly oval, basal divisions about .25 mm. in diameter: stems under 1 mm. in diameter.....U. GEMINISCAPA Benj.
      D. Leaves four times, occasionally up to five or six times dichotomous: flowering plants bearing a whorl of inflated petioles at about half-way up the scape; generally flowering annually....F.
        F. Basal divisions of leaf usually not elongate, 0+–10, commonly 3–5 mm. long, not slender, diameter .5 mm. and over: (scapes 15–33, commonly 20–30 cm. long, stout; flowers 3–14, calyx-lobes 4–6 mm. long). Restricted to southern U. S.....U. INFLATA Walt.
        F. Basal divisions of leaf elongate, 5–12, commonly 8–10 mm. long, slender, diameter .25 mm. and less: (scapes 6–26, commonly about 15 cm. long: flowers 2–5, commonly 3, calyx-lobes 3–4 mm. long). Maine southward. U. INFLATA Walt. var. MINOR Chapm.
    C. Leaves of one or two types, according to type of branches, whether generally associated with scapes or purely vegetative: branches generally associated with scapes always present, these with leaves one or two,

sometimes three times dichotomous, 2- or rarely a few 3-parted at bases, sparse, and slightly or not at all overlapping; branches of specialized vegetative type usually present on U. FIBROSA, these 5–9 cm. long, with crowded leaves nearly all three times dichotomous, basally 2–3-parted, when 3-parted not diverging at one exact point, bladders few or none....G.

G. Leaves characteristic of branches generally associated with scapes....H.

H. Leaves once dichotomous, rarely with abbreviated third division, usually not overlapping, bladders scattered, variable in size, and many near ends of leaves.....U. GIBBA L.

H. Fully developed leaves twice dichotomous, slightly overlapping, bladders scattered, but generally homogeneous in size (some branches growing under mud having bladder-bearing leaves much reduced in size and dichotomy, thus similar to certain branches on U. MINOR).....U. BIFLORA Lam.

G. Leaves of both types present, those of specialized vegetative branches as well as of branches generally associated with scapes; bladders most numerous near stems.....U. FIBROSA Walt.

B. Foliar divisions flat....I.

I. Margins of terminal divisions minutely and sharply serrate, leaves bearing few or no bladders, bladders mostly or wholly confined to the always present specialized branches, leaves basally 3-parted, divisions narrow, but usually distinctly flattened, all of one general form....J.

J. Apices of terminal divisions rounded or nearly so (save for uncommonly delicate condition in deep water), mucronate; bladder-bearing branches having no leaves.....U. INTERMEDIA Hayne.

J. Apices of terminal divisions acuminate; bladder-bearing branches having a few small leaves or none. Known only very locally in No. Am.....U. OCHROLEUCA Hartm.

I. Margins of terminal divisions entire, leaves all or most bearing bladders, few or no branches specialized for bladders alone, leaves usual 3-parted basally, but some on certain very slender plants 2-parted, altogether of two general forms, one very slender and slightly flattened, bearing a number of bladders (this the common form), the other broadly and distinctly flattened, less dichotomized, more abbreviated, bearing very few or no bladders (this the less frequent form and mostly of shallower water or of spring growth).....U. MINOR L.

A Key to the Winter Buds

A. Bud an elongate, thickened end of the stem, 1–2 mm. in diameter, bearing crowded, but not closely imbricated, abbreviated and incurled leaves, buds terminating all autumnal branches.....U. PURPUREA Walt.

A. Bud a rounded mass of divided, densely crowded, abbreviated and imbricated leaves....B.

B. Foliar divisions of buds bordered on two sides with stout gray hairs, flattened....C.

C. Buds 1–2 cm. long, oval, often one-sided or two-parted, composed of very many pseudo-pinnate, severally divided, basally 2-parted, small leaves, divisions of leaves flattened, elongate, narrowly triangular, and bordered with loose tufts of small hairs. . . . . U. VULGARIS L.

C. Buds 3–10, commonly 5–7 mm. long, oval to elliptical, never one-sided or two-parted, composed of many short, broad, few-times-divided, basally 3-parted very small leaves, divisions of leaves much flattened, squamiform-triangular, and bordered with dense tufts of coarse hairs. . . . . U. INTERMEDIA Hayne.

B. Foliar divisions of buds not bordered at all with hairs, bearing but a few setae as on mature leaves, either more or less terete or distinctly and broadly flattened. . . . D.

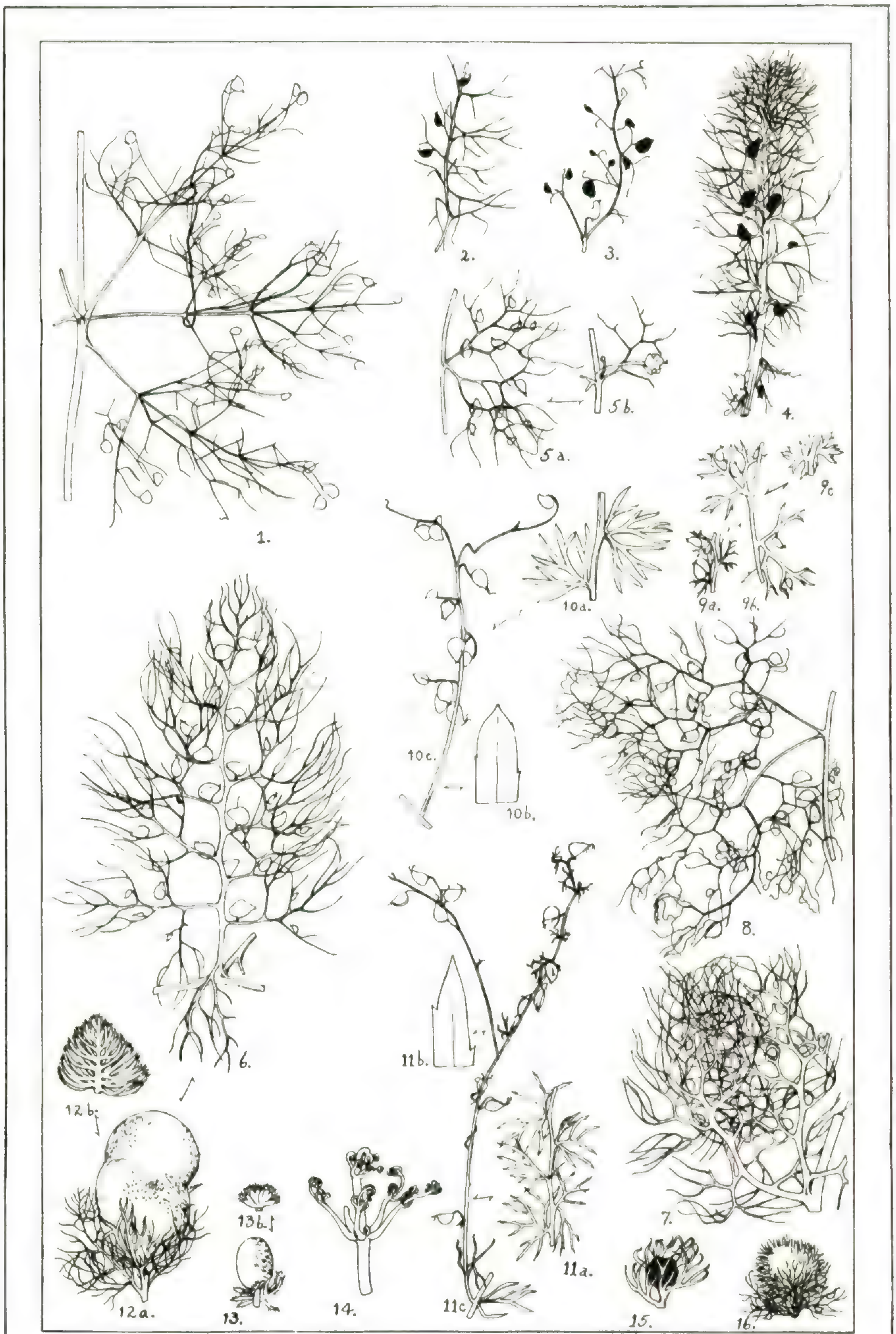
D. Buds round or compressed slightly at each end, 1.5–4, sometimes 5 mm. across (in growth and formation unique and quite comparable to the head of a cultivated cabbage, save for the narrow leaves), color reddish green, foliar divisions of completely formed winter bud distinctly flattened. . . . . U. MINOR L.

D. Buds rounded and usually somewhat one-sided and elongate, 5 mm. or much less in diameter, always merging to an attached piece of living stem bearing some leaves, color green, foliar divisions terete. . . . E.

E. Buds, when present, 2–5 mm. in diameter, formed of loosely integrated, small and slender leaves. (Fruit from cleistogamous flowers common, other fruit rare.) . . . . . U. GEMINISCAPA Benj.

E. Buds often not forming, but when present 1 mm. and less in diameter, formed of few, loosely integrated, small leaves, thus scarcely differing from the continually unfolding bud of midsummer: branches and buds, or fruit, forming the next generation. U. INFLATA Walt., U. INFLATA var. MINOR Chapm., U. GIBBA L., U. BIFLORA Lam., U. FIBROSA Walt.

The species under sections E are coastal plain types. Development in them of winter buds is slight or lacking. *U. biflora* and *U. fibrosa* are restricted coastal plain types extending no farther north than southeastern Massachusetts. These two species never develop true winter buds. Winter buds, then, are characteristic of our species occupying regions where they must lie dormant through a long winter. *U. geminiscapa* forms quite unspecialized winter buds, though often growing in very cold climates, but, as a compensation, produces many cleistogamously formed fruits. The species under E-2, with scarcely any development of winter buds, commonly flower and fruit in the usual manner, whereas those species forming specialized winter buds usually bear fewer or even no flowers, and much less commonly produce any fruit. Though *U. purpurea* and *U. vulgaris* are often found flowering and both form some fruit, *U. minor* and *U. intermedia* seem rarely to flower.



Ruth P. Rossbach del.

Utricularia: all figs. × 1; for Explanation see end of text.

Geographical Distributions and Habitats

The geographical distribution of the genus *Utricularia* offers strikingly clear-cut and widely applicable examples of the major plant dispersals of the earth, distributions made most significant by Prof. M. L. Fernald.[1]

One group of the genus represented with us is circumboreal (and only two to several of its species grow locally as far south as central Africa and southernmost United States).

The other group, or groups, occupy the North American coastal plain, the southern Great Lakes region, the lower Mississippi River Valley and adjoining lowland areas, and parts of the West Indies, Mexican Plateau, Central America, South America, Australia, Tasmania, Philippine Islands, and Asia, especially in the south, the restricted region about the Mediterranean Sea, and the valleys of, at least, the Nile, Congo, Zambesi, and Niger Rivers of Africa. Many of the areas occupied by this second group are known to be geologically ancient.

The circumboreal group grows typically under water, save for the flowering scape. The group of more southerly dispersal comprises terrestrial as well as truly aquatic forms, and is very diversified. Representative of the circumboreal species are *U. vulgaris* L. and var. *americana* A. Gray, *U. neglecta* Lehmann, *U. minor* L., *U. Bremii* Heer, *U. occidentalis* A. Gray, *U. intermedia* Hayne, and *U. ochroleuca* A. Hartm.

U. vulgaris, including var. *americana*, is frequent in quiet or sluggish water, and in this country known from the Straits of Belle Isle, Labrador and Newfoundland, south commonly through New England and western New York, then becoming less frequent, though occurring, southward to Dade Co., Florida, west, in the north, to Alaska and British Columbia, and in the south, west through Louisiana to Texas and locally to southern California, and present, where habitat is suitable, north and south between these outlined boundaries, especially in the East, the region of the Great Lakes, the Rocky Mountains in general, the Sierra Nevada, Cascades, and Pacific Coast; also in Asia, and in all of Europe.

[1] "Specific Segregations and Identities in some Floras of eastern North America and the Old World," Rhodora, xxxiii. 25–63 (1931).
"Recent Discoveries in the Newfoundland Flora," Rhodora, xxxv. nos. 409–420 (1933).
"A Botanical Expedition to Newfoundland and Southern Labrador," Rhodora, xiii. 109–162 (1911).

U. vulgaris var. *americana* A. Gray is attributed only to North America. However, this supposed variety is scarcely, if at all, separable from true *vulgaris*. The difference, a more slender and rather acute spur on the flower of var. *americana*, seems not to be sufficiently constant nor of sufficient magnitude to justify varietal rank.

U. neglecta Lehm. or, perhaps more wisely, *U. vulgaris* var. *neglecta* (Lehm.) Cosson & Germain is a very close, slender relative of *U. vulgaris*, and it occupies a region with it in Europe. It very often or usually bears well developed branching rhizoid-like shoots extending from very near or at the base of the scape. These outgrowths bear very short, thick, more or less palmate and slightly reflexed processes. On *U. vulgaris*, of this country at least, such growths are almost always diminutive or absent. However, some few forms (often slender, as are plants of *U. neglecta*) in North America bear these growths, occasionally as well developed as they are on *U. neglecta* of Europe.

Examples of *U. vulgaris* with rhizoid-like development in the United States are specimens from South Poland, Maine, collected by *Kate Furbish* in 1894, and from North Berwick, Maine, June 23, 1894, collected by *J. C. Parlin*, both in the herbarium of the New England Botanical Club; and there is pronounced growth of the sort noticeable on a collection by *Louis Williams & Rua Pierson*, no. 1333, July 23, 1933, from the Snake River bottom, Grand Teton National Park, Wyoming, elev. 6700 ft., in herbarium of Calif. Academy of Sciences at San Francisco. Another such collection is one from a muddy lagoon, Charcoal, valley of East River, Pictou Co., Nova Scotia, *Harold St. John*, no. 1450, Aug. 2, 1913, also in herb. of Calif. Acad. Sci.

The proliferations described might seem to be confined to *U. vulgaris* and its close relative, but the writer has observed, also, a case of quite elongate growth on the greatly differing species, *U. occidentalis* A. Gray, on a plant collected from Falcon Valley, Washington, by *W. N. Suksdorf*, July 28, 1883, sheets in herb. of Univ. of Calif. at Berkeley, and Dudley Herb. at Stanford Univ.

The region of Falcon Valley, in western Klickitat Co., Washington, is the type locality of the seemingly endemic *U. occidentalis* A. Gray (type coll. no. 1880 of *W. N. Suksdorf*, described in Proc. Am. Acad. xix. 95, 1883), which is similar to *U. minor* with the leaf-strewn, bladder-bearing branches, but the winter buds are not formed of obvious smooth leaves as in *U. minor*, but are composed of the hair-tufted,

scale-like foliar modifications characteristic of *U. intermedia.* Gray describes *U. occidentalis* as between these two species, and the resemblance is true of the leaves, which do range from the type of one species to that of the other, appearing as in either, as well as intermediate between the two, though more often as in *U. intermedia.* Such a combination of two different specific characters in one entity is noteworthy. *U. occidentalis* grows in a region not remote from both *U. minor* and *U. intermedia.*

A group of related species includes *U. intermedia* Hayne, *U. ochroleuca* A. Hartm., *U. minor* L., and *U. occidentalis.* The leaves, or at least what appear superficially to be leaves, of this group are typically three-parted at the base and flattened, as opposed to the leaves of the wholly differing group to which *U. vulgaris* belongs, which are parted twice basally, terete, and uniquely pseudo-pinnate. Both of these lesser groups are of a circumboreal distribution, however.

U. intermedia and its relatives bear bladders, not equally distributed upon all mature leaves as does *U. vulgaris,* but somewhat localized. Bladders are more or less present throughout the whole plant of *U. minor,* but, to an extent, in this species, and much more so in *U. occidentalis* and *U. ochroleuca,* are they abundant only on specialized branches bearing diminutive leaves. In *U. intermedia* there is a specialization of the characteristically larger bladder-bearing branches without leaves, whereas upon the foliar stalks there grow no bladders at all. The last is a well known species in shallow pools of bog-water and margins of boggy ponds and sloughs about the boreal portion of the earth.

In North America *U. intermedia* is distributed from the west coast of Greenland and from Newfoundland south to New Jersey and Pennsylvania, west, in the north, at least to British Columbia, and in the south, ranging west to Indiana, Illinois, Iowa, and further west only at higher altitudes to the Pacific States.

This distribution is of interest geographically in its relation to glaciated areas. As the species occupies boggy country of the northeastern, northern, and highland regions just outlined, it is, therefore, restricted to areas more or less glaciated during the Wisconsin period of ice-cap formation.

U. minor, though not by any means strictly a plant of bogs, has a similar geographical range in North America, from Disko, west coast of Greenland (specimen delicate and somewhat atypical, Gray

Herbarium) and from Blanc Sablon, Straits of Belle Isle, Labrador south through Newfoundland, St. Pierre et Miquelon, Magdalen Islands, Anticosti, Gaspé, Prince Edward Island and Nova Scotia, south inland through all of New England to western New York, and on the coast to Long Island and New Jersey, and west, in the north to the Mackenzie Basin (*H. M. Raup*, no. 3138), and at least to British Columbia, and in the south, growing west to the region of the Great Lakes, then locally at higher altitudes to the Pacific States. It is also in northern Asia and generally throughout Europe.

The range, at least in North America, with some local exceptions in the Northeast, covers partially glaciated areas. *U. vulgaris*, covering the same range, occupies, besides, the central plains and extends much further southward.

In Europe a species related to *U. minor*, called *U. Bremii* Heer, is recognized. This surely seems, from study of a number of specimens and from description, to be *U. minor* or, at best, no more than a variety of it, to which it was first relegated by Franchet. Morphological differences do not stand out.

Near *U. intermedia* is a species, *U. ochroleuca* A. Hartm., which bears leaves with acuminate rather than blunt and mucronate divisions, as does *U. intermedia.* Furthermore, the bladder-bearing branches may have a few leaves, a condition not true of its relative. In the Gray Herbarium at Harvard University one finds *U. ochroleuca* represented from East Prussia and locally southward through the rest of Germany. It has been considered an Old World species. Thus it is noteworthy that *Perry & Roscoe*, on July 23, 1929, collected *U. ochroleuca* at Lena Lake, St. Paul I., Nova Scotia. Collections are in the Gray Herbarium as follows: *Perry & Roscoe*, no. 351 a, July 23, 1929, and no. 351, Aug. 10, 1929.

So much for the circumboreal group, and now to turn to those of more southerly, and, individually, rather more limited distributions.

Among the Utricularias of the groups especially occupying the Atlantic coastal plain of America are a number of terrestrial species usually growing in wet sand or peat, but also among the plants of this distribution are many aquatic species, the northeastern American members of which are *U. purpurea* Walt., *U. inflata* Walt., *U. inflata* var. *minor* Chapm., *U. gibba* L., *U. biflora* Lam., *U. fibrosa* Walt., and *U. geminiscapa* Benj. These obviously do not comprise a homogeneous group morphologically, but merely share a generally similar geographical range.

Among all the species in North America *U. purpurea* is unique. The leaves are whorled. The winter bud is a thickened end of a stem bearing abbreviated, incurled, and uniquely remote leaves, whereas specialized buds of other species are more or less rounded masses of closely imbricated leaves or leaflike scales upon a very short axis.

U. purpurea Walt. is common in ponds and sluggish, but generally not extremely shallow water. It occupies a wide range north and south, recently found to be more extensive than formerly known: Montreal Co., Quebec, south through Nova Scotia and New Brunswick and the Atlantic coastal states to Florida; Mississippi, Louisiana; northern Indiana and Michigan to Minnesota; Cuba; British Honduras.

In Montreal Co., Quebec it grows near the city of Montreal, and therefore in the low valley proper of the St. Lawrence, as is to be expected of a generally coastal plain plant extending northward. The isolated representation from British Honduras was collected at All Pines by *W. A. Schipp*, no. 608, Sept. 1, 1930, specimens observed in the Gray Herbarium and at the University of California at Berkeley.

A single relative of *U. purpurea* in the New World is *U. myriocysta* St. Hil. & Girard. Both species have whorled leaves and purple flowers. In the Gray Herbarium *U. myriocysta* is represented only from British Guiana.

U. inflata Walt. and its var. *minor* Chapm. are recognizable by the single whorl of inflated, petiole-like processes radiating from the base of the flowering scape which usually appears annually. The leaves are not whorled, but arranged as are those of most aquatic species. Var. *minor* Chapm. (*U. radiata* Small) is distinguishable from typical *inflata* in that the basal divisions of the leaf are longer and much more slender throughout the plant (for comparative measurements see key), in the generally shorter, fewer-flowered scapes, and in the smaller size of the plant and all its parts.

It is noticeable, then, that all the many collections of *U. inflata* from the northeastern United States are not of typical *U. inflata*, as is most often supposed, but are of Chapman's variety *minor*.

Typical *U. inflata* is a plant of the Southern States only. It has been collected from quiet water on the southern Atlantic coastal plain and the lower Mississippi Valley region, which is known to be a related area botanically. From Florida it is represented from Duval, Volusia, Pinellas, Lee, and Brevard Counties, from Screven Co., Georgia, and locally from South Carolina. There is one record as far north as

Grassfield, Norfolk Co., southeastern Virginia, *Fernald & Griscom*, no. 4501, May 7, 1935, in Gray Herbarium. Collections have also been studied from Madison Co., western Tennessee, Cherokee Co., eastern Texas, and Sansaba Co., central Texas. This robust plant only occasionally intergrades with variety *minor* in the generally diagnostic foliar character mentioned and in size.

The range of var. *minor* is disrupted, it having been collected from Hancock, Waldo, and Franklin Counties of Maine, south near the coast commonly to New Jersey, then becoming very local, if not lacking, southward, reappearing in pine barrens of Duval, Lake, Brevard, and Polk Counties, Florida, and collected at least once from near the Paraguay River and Concepcion, Paraguay, and from Santarem, on the Amazon River, Brazil, by *R. Spruce*.

The strikingly isolated plants from South America have quite the appearance of *U. inflata* var. *minor* as concerns all gross morphology of herbarium specimens, at least. The collection by *R. Spruce* from Santarem was first named as a separate species, *U. quinqueradiata* Spruce ex Oliver in Journ. Linn. Soc. iv. 171 (1860). No description is there given other than the following:

> "No. 1053 *U. quinqueradiata* (Spruce's MSS.). Santarem.—I regard this as a small form of the *U. inflata*, Walt., of the North American continent. Specimens from Florida (Rugel, coll.), labelled *U. inflata*, var. *minor*, do not seem different."

There is no reason to doubt this statement, despite geographical separation; the plants of both continents are probably the same.

It is of interest that at least one other species, *U. stellaris* L., bears inflated petiolar growths as does *U. inflata*, though it differs in the sacs being shorter and all the leaves being whorled. This plant is represented in the Gray Herbarium from the valleys of the Nile, Congo, and Niger Rivers of Africa, and from Malabar on the southeast coast of India, and is known to grow elsewhere in both Africa and India.

A North American coastal plain dispersal of quite expanded sort northward is to be found in the range of *U. geminiscapa* Benj. (*U. clandestina* Nutt.). *U. geminiscapa*, with its delicate leaves of rounded outline and twin bases and its commonly occurring cleistogamous and fruiting flowers, is frequent in ponds and bog-pools of the northeastern coastal plain and related or adjacent areas: western Newfoundland; Magdalen Islands of Quebec; Nova Scotia; Hancock and Waldo

Counties, Maine, south chiefly near the coast to Delaware and Pennsylvania. A quite isolated southern locality is represented by the collection of *Fernald & Long*, no. 4187, July 28 and 29, 1934, from Cape Henry, Princess Anne Co., southeastern, Virginia. The species grows isolated inland in Orleans Co., Vermont, and it occurs in a sandy region of the Connecticut Valley in Hampden and Berkshire Counties of western Massachusetts. Vilas Co., Wisconsin is another noteworthy isolated area represented.

Other coastal plain plants, including *Utricularia gibba*, are commonly reported from this region of the Connecticut Valley of Massachusetts; and to find coastal plain affinities in the southern Great Lakes region is, of course, an old story, but an ever expanding one as regards the generally coastal Utricularias of that area.

Similarly, such plants as *U. geminiscapa* may extend to the northeast not only via Cape Cod and Nova Scotia, and even to western Newfoundland, as Prof. Fernald points out, but may, as is known, even follow the inner coast, that is, of Maine, more remote from the eastwardly sunken coastal plain. *Chamaecyparis thyoides* grows more and more locally eastward on the coast to York Co., Maine, reappearing in Waldo and Knox Counties, whereas some other similarly distributed plants meet the boreal types as far east as Mt. Desert Island. It is of interest, but not surprising, then, that Utricularias of the expanded coastal plain dispersal should be common in these many named areas outside the true Atlantic coastal plain.

Though *U. geminiscapa* does not seem to have been collected from British Honduras, a very similar plant, but with "flowers deep rose colour" instead of yellow was collected by *W. A. Schipp* at All Pines, British Honduras, no. S 90, Sept. 2, 1930, in herbarium of Univ. of Calif. at Berkeley. It was at All Pines that Schipp collected the northern coastal *U. purpurea* cited above.

U. gibba L. is a fine example, in its distribution, of the coastal plain groups. It is not restricted to the coast, but much commoner near it, known from Megantic Co., Quebec, Lunenburg and Yarmouth Counties, Nova Scotia, and Maine, south to Florida and west to Louisiana, near the Gulf Coast, also Ouachita Parish, valley of Washita River, northern Louisiana; isolated in western Vermont, Hampden and Berkshire Counties of the Connecticut Valley in western Massachusetts, and western lowland New York to southern Ontario, Michigan, Wisconsin, Ohio, Indiana, Illinois, and, according to Gray's Man.,

7th ed., in Minnesota (specimens not observed from Minn.). Isolated collections come from Tennessee, and from Tarrant Co., northern Texas, and specimens probably of this species have been observed from elsewhere in Texas and north into Oklahoma. *U. gibba* is also in California. Plants seemingly of this species appear from the Bahamas, Porto Rico, Mexico, and, again, British Honduras.

The generally once-dichotomous, very delicate leaves of but one type, with many bladders, especially near ends of leaves, as characteristics serve fairly well to distinguish the vegetative plants of *U. gibba* from other North American species, and when it is in flower, as is frequent, the noticeably small, laterally flaring corollas further decide determination.

It is noteworthy that just such specimens as described above of this once supposed eastern coastal plant appear in collections from California, most of them properly identified as *U. gibba.* At least, complete morphological characters observed in pressed material (and some fresh) point definitely to that species. H. L. Mason published an article on the occurrence of *U. gibba* in California in Madroño, ii. p. 23 (1931), and I find that most of the following citations of collections observed by the writer were first noted by Dr. Mason in his article. Citations of sheets studied are as follows: Bogg's Lake, Mt. Hannah, 2500 ft., Lake Co., *J. W. Blankinship,* Sept. 10, 1928, in herb. Calif. Acad. Sci.; slough at Holt, San Joaquin Co., *John Thomas Howell,* no. 4411, Sept. 21, 1929, in herb. Calif. Acad. Sci.; irrigation ditch, Stockton, San Joaquin Co., *Walton Clark,* Aug. 26, 1923, in herb. Calif. Acad. Sci.; ditch 3 mi. southeast of Santa Rosa, Sonoma Co., *M. S. Baker,* Nov., 1898, in herb. Univ. Calif. at Berkeley; Swamp Lake, 5200 ft., Tuolumne Co., *H. L. Mason,* no. 11593, July 23, 1937 (aquatic form with no flowers, and emersed form from floating log), bearing flowers in herb. Univ. Calif. at Berkeley. Thus a marked addition to the once supposed range was brought to light.

U. biflora Lam. and *U. fibrosa* Walt. are close to each other and both in the *U. gibba* relationship according to appearances. *U. fibrosa* seems characteristically to bear several purely vegetative branches crowded with comparatively large leaves which are nearly all three times dichotomous and supporting very few or no bladders. *U. biflora* differs vegetatively from *U. fibrosa* in seemingly not having these specialized vegetative branches. The fully developed leaves of *U. biflora* (and those of unspecialized branches of *U. fibrosa*) are some-

what larger than those of *U. gibba* and are twice dichotomous, whereas leaves of *U. gibba* are once dichotomous, rarely with an abbreviated third division. The flowers of *U. gibba* are distinctly smaller than those of *U. fibrosa* and than almost if not quite all those of *U. biflora*, and the spur of *U. gibba* is distinctly shorter than that of the two relatives.

The geographical distributions of *U. fibrosa* and *U. biflora* are very similar but cover only a portion of the range of *U. gibba*, being restricted, at least northward, to the coastal plain area itself, extending locally in ponds north only to southeastern Massachusetts, along with a number of better known but similarly restricted plants. Judging only from well collected sheets, *U. biflora* is represented from Barnstable Co., Massachusetts south near the coast to Florida; Mississippi to Texas and north into Oklahoma; also probably south of the United States.

U. fibrosa reveals records from certain ponds of Plymouth, as well as Barnstable Counties, Massachusetts; Long Island, New York, and New Jersey, south, probably locally, to Florida; Alabama and Mississippi; also possibly south of the United States.

Subtropical and tropical Utricularias of the *gibba-biflora* relationship grow in parts of the West Indies, Mexico, Central and South America. These include imperfectly known species, more or less similar to each other and to *U. gibba* or to *U. biflora*. Due to few and incomplete specimens final statements of the taxonomic or local geographic situations concerning these seem at present to be impossible. And, eventually, careful synoptical work will be necessary on the group from the southern United States southward.

It seems probable that species of this relationship, but not discussed here, extend northward as a subtropical complex into the Gulf States and possibly westward in the lower valleys. But probably *U. gibba*, *U. biflora*, and *U. fibrosa* are the only species of such a relationship to be found in the area covered by Gray's Manual.

Because it is well outside the Manual range a certain whole group of strikingly distinct aquatic Utricularias, those of the *U. oligosperma* relationship, extending north to peninsular Florida and the Gulf Coast, has been here omitted from consideration. One species is known from southern Florida to Louisiana. These aquatics are large plants with excessively ramified, elongate, bladderless leaves and elaborate, specialized, leaflike branches dispersed among them (and

not at their bases) and bearing many bladders. Such a form of plant is outwardly similar to no other group of the genus.

Finally, a discussion might be devoted to qualities of the habitat of North American Utricularias. All species of the Atlantic coastal plain dispersal grow in what would seem to be only acidic waters or soils, usually in sandy and boggy localities.

U. gibba, *U. biflora* and *U. fibrosa*, of peaty or somewhat sandy pond-shores, nearly bridge, in habitats, the aquatic with the truly terrestrial species. *U. biflora* commonly becomes stranded or nearly so, and when in this condition will develop pale branches just beneath the mud, somewhat as does *U. cornuta* of boggy or wet sandy ground, save that the leaves on such branches are not the erect, slightly emerging, and simple leaves of *U. cornuta*, but are, in form, essentially like the usual ones of *U. biflora*, being merely reduced in size. Bladders are always borne on such leaves, and the appearance of these branches is much like certain similar growths more common to *U. minor*.

Upon becoming stranded in late summer, flowering of these three species is usual. *U. gibba*, though often growing in tangles or rafts fairly well off shore (as well as very near shore), fully as commonly as *U. biflora* becomes stranded also; and it can grow, it would seem, to better advantage thus than *U. biflora*. Flowering usually becomes profuse. The few radiating stems subtending a scape will dry up, yet the plant persists with the habit of, say, the terrestrial *U. resupinata*. *U. gibba*, especially, may be found in either aquatic, and then usually vegetative, condition or in terrestrial and fruiting phase, and the habit may be in all stages between the two forms according to environment, yet obviously the same species. The neighboring Myriophyllums behave quite similarly.

Among the circumboreal species there is no general preference toward acidic or basic waters. *U. vulgaris* is common in all circumneutral or somewhat acidic waters of its range, and some specimens from the Great Plains and the Southwest are encrusted with alkaline deposit.

U. minor, however, despite possible and seeming exceptions, shows preference for basic waters, often growing in ponds washing a calcareous bed. And, as local New England collectors can testify, *U. minor* may even grow in alkaline tidal inlets, such as Winnegance Creek, Phippsburg, Sagadahoc Co., Maine, and creeks at Falmouth, Massachusetts, in which cases growth is variously and oddly modified. (See herb. New England Bot. Club.)

The writer has most commonly found *U. minor* in water proximate to more or less calcareous rock, yet he has also found it in the open, deeper places and thoroughfares through sphagnous bogs, generally supposed to be an acidic habitat by field botanists. Such a habitat is to be found in the deeper, open water of the thoroughfare through Knights Bog, foot of Pitcher Pond, Northport, Waldo Co., Maine. Nearby, *U. intermedia* and *U. geminiscapa* grow in the bog-bound, shallow pools not occupied by *U. minor*.

In one instance noted by the writer *U. minor* grew in water of a deep bog, and was near *Sphagnum*, *Chamaedaphne*, etc., but in close company with *Nitella*. This was on the bottom, not the shallow sphagnous margin, of a spring-fed pool (near Beaver Pond, Lincoln, Massachusetts). *U. minor*, however, in no case grew in the smaller, stagnant pools intimately surrounded by the acid-loving and acid-creating *Sphagnum*, as is often the case with the similar *U. intermedia*, and true, as well, of the quite differing *U. geminiscapa*. The pool in question being rather deep and partially fed by an underground flow might well have had both basic and acidic habitats for plants, the basic tending to dominate below. This condition, as a guess, may also have been true in the case of *U. minor* growing in the deep center of the slough in a sphagnous bog.

U. intermedia generally occupies acidic water throughout its range in this country, and yet, occasionally, it is collected from a marl bog: "In marl, edge of Meadow Lake," valley of the Limestone River, Fort Fairfield, Aroostook Co., Maine, *M. L. Fernald*, 1898, Gray Herb. To certain other such seeming aberrancies in Aroostook County Prof. Fernald has already called attention.

But the water, altogether testing as acidic or basic either, of course constitutes no absolute or accurate indication of the actual chemicals needed and used by plants growing therein. Physiological study of chemical requirements for certain Utricularias might explain the seemingly unusual habitats.

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EXPLANATION OF FIGURES

UTRICULARIA PURPUREA: FIG. 1, a whorl of leaves on stem, showing only the bases of two of the divisions; FIG. 14, winter bud, showing fleshy winter-resistant portion with its incurled leaves.

U. BIFLORA: FIG. 2, portion of stem bearing leaves.

U. GIBBA: FIG. 3, portion of stem bearing leaves.

U. FIBROSA: FIG. 4, specialized vegetative branch.
U. GEMINISCAPA: FIG. 5 a, a leaf; FIG. 5 b, a cleistogamous fruit (split open by pressure); FIG. 16, winter bud.
U. VULGARIS: FIG. 6, a leaf, showing only the base of one half; FIG. 12 a, winter bud; FIG. 12 b, foliar modification from winter bud, × 5.
U. INFLATA: FIG. 7, a leaf.
U. INFLATA, var. MINOR: FIG. 8, a leaf.
U. MINOR: FIGS. 9 a & b, portions of stems from two plants showing two common forms of 3-parted leaves; FIG. 9 c, portion of stem bearing two 3-parted leaves of the less frequent, short, broad and bladderless form, especially of vernal growth from winter buds or of nearly terrestrial plants; FIG. 15, winter bud, with the usually somewhat incurved subtending leaves.
U. INTERMEDIA: FIG. 10 a, portion of stem bearing the 3-parted leaves; FIG. 10 b, apex of a terminal foliar division, × 5; FIG. 10 c, specialized bladder-bearing branch; FIG. 13, winter bud; FIG. 13 b, foliar modification from winter bud, × 5.
U. OCHROLEUCA: FIG. 11 a, portion of stem bearing leaves; FIG. 11 b, apex of a terminal foliar division, × 5; FIG. 11 c, bladder-bearing branch.
All figures natural size unless otherwise indicated.

SOME RECENT ADDITIONS TO THE FLORA OF BERKSHIRE COUNTY, MASSACHUSETTS

George J. Wallace

In spite of the thirty years of exploration and research that is back of Hoffman's admirable *Flora of Berkshire County*,[1] a census of the flowering plants occurring at the Pleasant Valley Bird and Wild Flower Sanctuary in Lenox during the spring and summer of 1938 disclosed additional species that seem well worth recording. But for two interesting exceptions, these new species, as might be expected, consist of exotics, presumably introduced since the publication of Hoffman's work. Mention should also be made of several other plants which, though known in the region before, have changed their status markedly in the last decade or two.

Census work was confined to the Sanctuary grounds, a 306-acre tract of land comprising old meadows, marshes, alder swamps, and the deep cool woods of a mountainside. The whole area ranges in elevation from 1200 feet in the valley of the included trout stream to 1800 feet at the summit of Lenox Mountain. To the wealth of plant species naturally occurring in such a diversity of habitat may be added many deliberate as well as accidental introductions—bog species in the artificial bog, woodland plants in the Fernery, berry-producing shrubs planted to encourage birds, and a great number of unforeseen

[1] Hoffman, Ralph, *Flora of Berkshire County, Massachusetts*. Proc. Boston Soc. Nat. Hist. Vol. 36, No. 5, 1922, pp. 171–382.

associates that seem to spring up whenever transplantations are made. Offsetting these advantages, as far as the number of species listed is concerned, are the facts that the area involved is essentially a plateau lacking the virtually hundreds of plants indigenous in the lower river valleys; that the area has not been under cultivation for many years, thus eliminating many weed species; and that the census work was confined to a single season (by a single person with many other duties), so that many difficult groups, such as grasses and sedges, were only partially worked out.

A total of 525 species of Spermatophytes were listed for the season. Additional varieties of course occur, but are not included in this number. The following are believed to be either new for the county, or else to exhibit a marked extension of the range formerly accorded them.

SERAPIAS HELLEBORINE L. Though not strictly a recent addition to the local flora, the present widespread distribution of this formerly rare orchid merits its inclusion here. The small colony originally discovered in Stockbridge in 1898 by Miss Caroline Wells was destroyed at an early date and the plant remained unknown in Western Massachusetts until rediscovered in 1931 by nature teachers at Camp Sumner. Since then the lost orchid has come into prominence and its occurrence has been noted in quite a number of localities. It seems thoroughly at home in the woods at the Sanctuary, several dozen widely scattered specimens having been found during the summer of 1938. There is no record of its deliberate introduction by planting. Considering its European origin it is perhaps not surprising to see this introduced form spreading more rapidly than our native species.

PIMPINELLA SAXIFRAGA L. There appears to be no previous record of the occurrence of this species in Berkshire County, although from the range accorded it in Gray's Manual there is no particular reason why it should not be found. From late July until mid-September scattered specimens of this European parsley appeared in bloom, appropriately enough, on the Sanctuary's Nature Trail, in an open portion planted several years ago to young spruces, and thus possibly explaining the source of seed. It extended over several square rods of territory, a delicately pretty, but not very conspicuous plant, its superficial similarity to several other white parsleys perhaps preventing its earlier detection both here and elsewhere.

MONARDA FISTULOSA L. It is a little surprising to find in connection with this species that Hoffman mentions only the variety *rubra*, found near a dwelling in Lanesboro. At the Sanctuary the type, not the variety, is among the most common and conspicuous of our late summer wild flowers, blooming for nearly two months. Its identifi-

cation is perhaps more frequently the subject of inquiry than any other plant on the grounds, this fact among others suggesting that it may have been introduced recently. Though native to this country, its presence in the Berkshires must have some other explanation. It grows abundantly in old fields, thickets, along the roadside, and the margins of the Sanctuary Pond, in either moist or dry soil.

Veronica Chamaedrys L. This species, originally naturalized from Europe in a few places, has likewise probably recently invaded the Berkshires, the first specimens noted appearing on the edge of the Sanctuary lawn in May 1938. Verbal reports of its occurrence in other near-by areas have come to my attention, but only the specimens at the Sanctuary have been personally verified. A similar species, *Veronica Tournefortii* C. C. Gmel., listed by Hoffman for Lanesboro and Pittsfield, also appeared here, in 1937, as a weed in a rock garden; but it did not reappear the following year until November when a luxuriant clump bravely bloomed just in advance of a heavy snowstorm. It still retained some of its petals when the snows disappeared during a December thaw.

Plantago virginica L. The unexpected occurrence of this species, known heretofore, in New England, only from a few coastal regions, has been reported in a previous number of this journal.[1] About a dozen specimens were located along a sandy portion of the shores of the Sanctuary Pond.

Helianthus grosseserratus Martens. Perhaps the most interesting of the new species found at the Sanctuary in 1938 is this native sunflower, apparently not previously reported for this county, although it is well within the range of the species. Some two dozen or more specimens were found growing among the tall goldenrods of a waste acre or two, the sunflowers, for the most part, towering above the tallest of the associated weeds.

Hieracium florentinum All. It may be of interest to mention the local spread of this European Hawkweed. Recorded in Gray's Manual as naturalized from eastern Quebec to Northern New York, and mentioned by Hoffman as adventive in Egremont, Massachusetts, it now appears to be a frequent field and roadside weed. A nearly identical species, *Hieracium floribundum* Wimm. & Grab., not listed by Hoffman, is also believed to occur, but unfortunately its specific distinctness was not satisfactorily verified at the time it was noted.

Pleasant Valley Bird and Wild Life Sanctuary,
Lenox, Massachusetts

[1] Rhodora **40**: 424, 1938.

THE STATUS AND DISTRIBUTION OF CYPERUS DISTINCTUS STEUD.

Hugh T. O'Neill

Torrey (Ann. Lyc. N. Y. **3**: 275–76. 1836) describes under *Cyperus vegetus* Willd.? (the interrogation point is Torrey's) a plant with "nut lanceolate, attenuated to a long point, tumid at the base" and concludes with "This species greatly resembles *C. virens*, but it can be distinguished by its smooth, obtusely triangular culm, and long-pointed nut with a remarkably cellular bulbous base. It is probable that our plant is a distinct species from *C. vegetus* of Vahl and Willdenow."

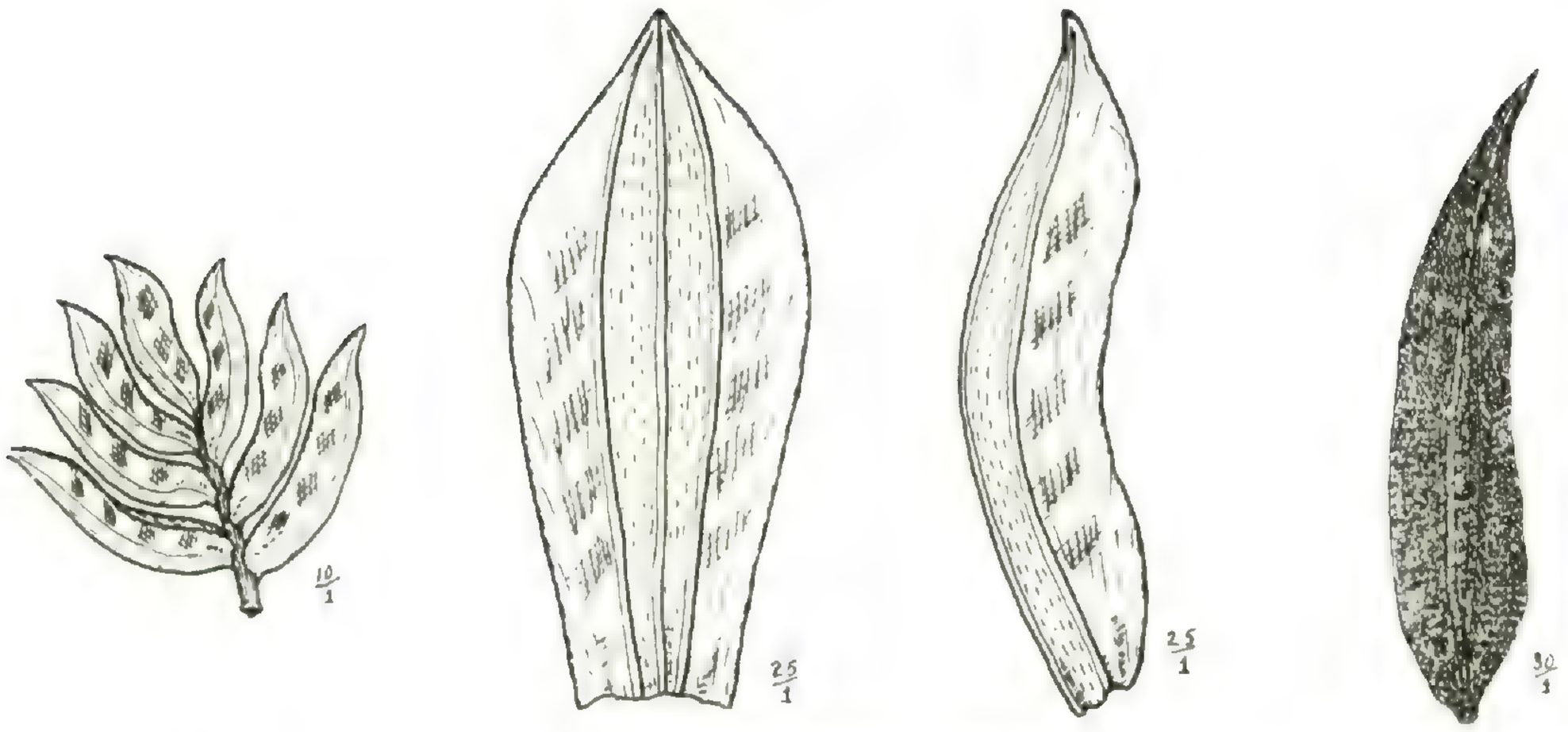
Steudel (Syn. Pl. Cyp. 24. 1855) describes this same plant as: "achenio lanceolato longe acuminato-attenuato, basi sub-bulboso tumidulo" and gives the range as "Carolina Florida Georgia" in accord with Torrey. He very appropriately named this plant *C. distinctus* and distinguished it clearly from *C. vegetus* Willd. and his own *C. pseudovegetus*. *C. distinctus* has a large mass of spongy parenchyma at the base of the achene (the torulose base or spongy hypogynium). This feature is constantly present on all mature achenes. It is entirely wanting in *C. vegetus* and *C. pseudovegetus*. Curiously, while American authors took up the less distinct *C. pseudovegetus*, the much more clean-cut *C. distinctus* never found its way into American literature. It is not mentioned, even as a synonym, in Chapman's Flora of the Southern States (1860, 1883, 1897) nor in Small's Flora of the Southeastern United States (1903, 1913) and Manual (1933). Patterson's Check-list (1892) and Heller's Catalogue, 2nd edition (1900), merely mention *C. distinctus*.

Only one other species of *Cyperus* in the United States has achenes torulose at the base, *C. oxylepis* Nees, recently reported from this country (O'Neill. Rhodora **40**: 358. 1938). This peculiar hypogynial structure is very much less developed in *C. oxylepis* than in *C. distinctus*.

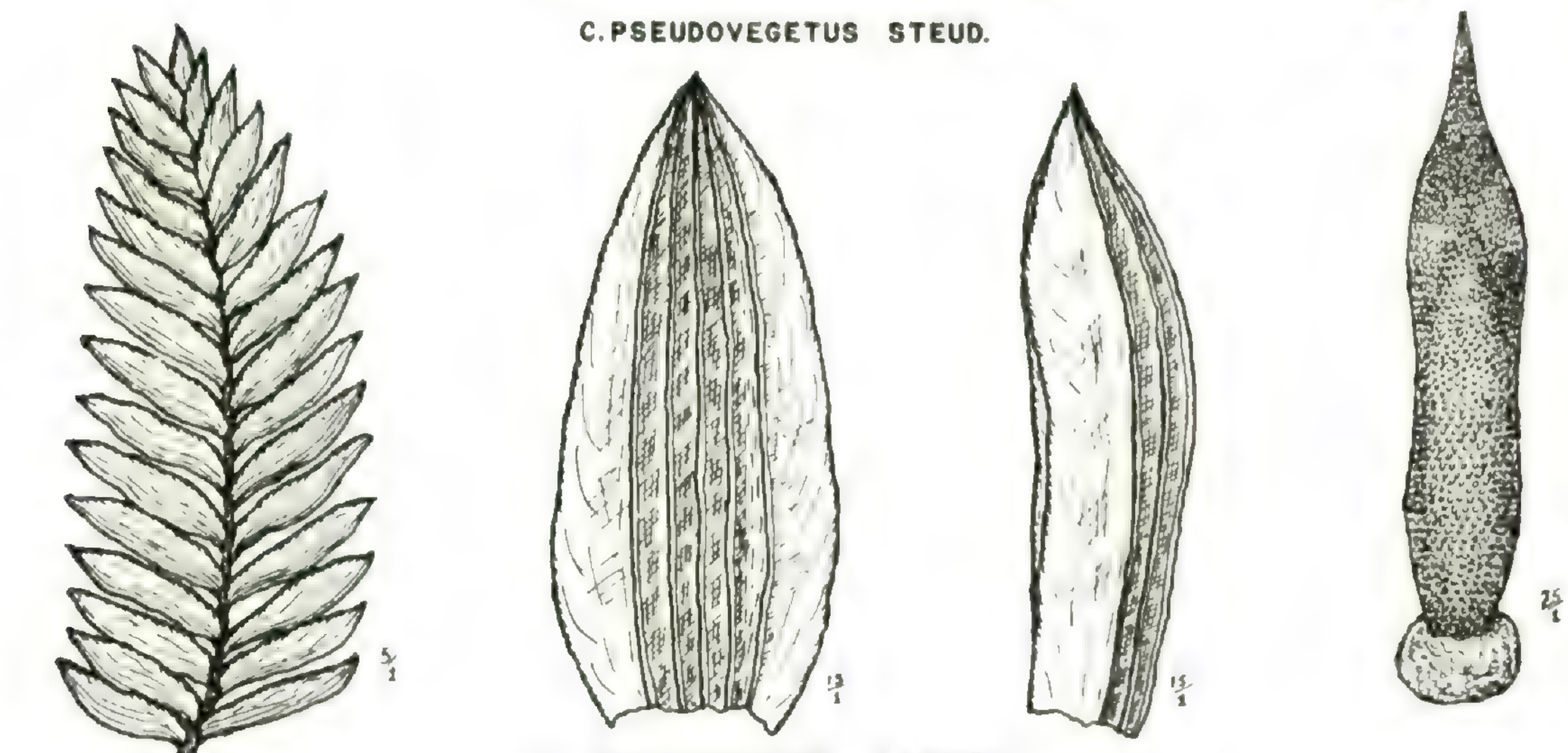
Kükenthal (Pflanzenreich 4^{20}: 178. 1935–36) recognizes *C. distinctus* but cites only one specimen.

These three species may be recognized by means of the following key:

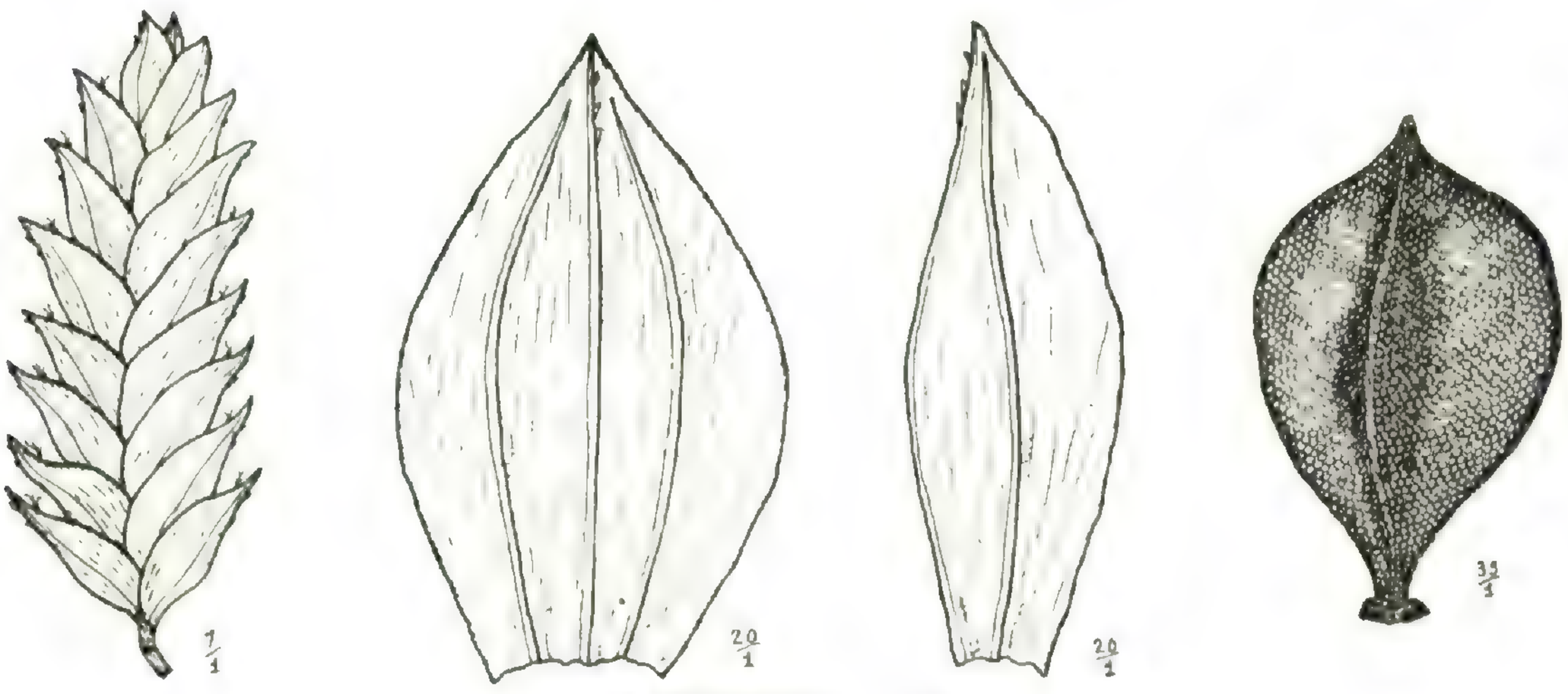
1. Base of achene conspicuously torulose, about 0.35 mm. wide, 0.2 mm. long, body of achene linear-oblong, 1.0–1.2 mm. long, 0.2–0.3 mm. wide, its beak an additional 0.5 mm. long. Spikelets 6–14 mm. long ..... *C. distinctus* Steud.
   Base of achene not at all torulose ..... 2.



C. PSEUDOVEGETUS STEUD.



C. DISTINCTUS STEUDL.



C. ERAGROSTIS LAM.

2. Spikelets 2.5–4.0 mm. long; glumes 1.6–2.0 mm. wide, not falcate; style about 1.0 mm. long; stigma about 1.0 mm. long; achene obovoid, 0.6 mm. wide, straight.
(*C. vegetus* Willd.) = *C. Eragrostis* Lam.
Spikelets 10–20 mm. long; glumes 0.8–1.0 mm. wide, falcate; style about 0.5 mm. long; stigmas about 0.5 mm. long; achene linear, 0.25 mm. wide, falcate . . . . . *C. pseudovegetus* Steud.

The accompanying figure further illustrate these specific differences.

Although Torrey cites a specimen from North Carolina, I have been unable to find this specimen and have found no subsequent collection from this state. The range of this species appears to be South Carolina, Georgia, peninsular Florida and the Bahamas, i.e. the southeastern coastal plain and the Bahamas. A list of specimens studied follows:

South Carolina: *Gibbes,* Charleston. Georgia: *Pyron and McVaugh,* St. Simon Island. Florida: *Curtiss,* Indian River, 3062, 5238; *Eaton,* Miami River, 302; *Garber,* Miami; *Hitchcock,* Marion County, 2103, 2105, 2106, 385; *Fredholm* 6184; *Harshberger,* Lake Okeechobee; *LeRoy* sine loc.; *Lighthipe,* Duval County; *Lovett* 179; *Moldenke,* Pompano, Jacksonville, 5254; *O'Neill* 5263, 7629, 7460; *Williamson,* Jacksonville; *Donnell-Smith,* Tampa; *McAtee* 1691; *Standley* 12620, 19026; *Francis* 26. Bahamas Islands: *Britton and Brace* 485, Southwest Bay.

The range of *C. pseudovegetus* is northern Florida to Texas and north to Kansas, southern Indiana, southern Illinois, Kentucky, Maryland and southern New Jersey. *C. Eragrostis* is confined to Oregon and California in this country. It occurs as a fugitive in the eastern states, France, New Zealand, etc.

Langlois Herbarium,
Catholic University of America

NOTES ON NEW ENGLAND ALGAE I: CYCLONEXIS AND ACTIDESMIUM[1]

R. M. Whelden

Among the algae there are many species which are considered extremely rare. One of these is *Cyclonexis,* which Stokes (4) found in New Jersey occurring among Sphagnum plants and described in 1886

[1] Contribution from the Laboratories of Cryptogamic Botany and the Farlow Herbarium, Harvard University. No. 166.

on the single species *Cyclonexis annularis*. In this country it was subsequently recorded by Tiffany (5) in 1934 as occurring in a fish hatchery at the west end of Lake Erie.

In Europe the occurrence of the alga has been recorded twice, first in England by Grove (1) in 1920 and later in Germany by Pascher (2). In none of the records are any extensive notes concerning the alga given. The alga is placed in the family Ochromonadaceae of the Chrysophyceae, a family which includes the more commonly found genus *Dinobryon*.

Early in May (1938) Mr. E. W. Thompson, collecting algae in various ponds and streams in the vicinity of Andover, in eastern Massachusetts, found what he immediately decided was *Cyclonexis annularis* Stokes and reported it to the author. Shortly thereafter, the two of us visited the pool in which the alga had been found. This pool, formed by the partial obstruction of a small brook, is about thirty feet across and at most only a few inches deep, rather densely shaded by bushes and trees, and largely filled with several aquatic species of sedges and grasses.

On this second visit we gathered several bottles of material from various parts of the pool, collecting between two and three o'clock in the afternoon. Returning to the laboratory the writer carefully observed the material collected and could find no sign of any plant sug-

gesting *Cyclonexis*, there being found only sterile filaments of an *Oedogonium* sp., filaments of *Tribonema bombycinum*, and a small number of desmids and diatoms.

The following week we again visited the pool, at about the same time of day and gathered as before, from the same parts of the pool, in which there remained very few of the filamentous algae. On examination a few hours later, *Cyclonexis* was found present in rather large numbers, being especially abundant in the collections made by sucking up material from among the dead maple leaves in the bottom of the pool. The writer watched attentively and examined carefully a great many of the ring-shaped colonies (Fig. 1 a, b).

Most of the colonies seen were composed of from eight to twenty cells. The individual cells were 18–20 μ long and 6–10 μ in diameter at the widest part. The cells of a colony varied somewhat in diameter, but were very uniform in length. The longer of the two cilia usually extended out from the apex of the cell to a length of 20 to 25 μ, but was sometimes recurved over the outer surface of the cell (Fig. 2 b), while the shorter cilium was 6–8 μ long and nearly straight or only slightly curved. Repeated examination failed to show any indication of the spiral nature of the shorter cilium figured by Stokes and others. The plastids seem to be somewhat variable in position although most frequently they occur as two elongate parietal plates against the lateral walls of the cell. Not infrequently one occurs near the larger end of the cell and is then more or less shell- or cup-shaped.

On several occasions while a colony was being observed it was met by a small crustacean or other swimming animal. Almost always the consequences of such an encounter were fragmentation of the *Cyclonexis* colony. Sometimes it merely broke in two, each of the halves then bending together to form smaller colonies (Fig. 3 a, b). Often fragmentation resulted in unequal colonies, one being composed of only two to five cells. Many cases were observed in which single cells broke away from the colony on such occasions (Fig. 2 c, d). Twice colonies were observed to break up completely into their individual cells.

Not only does fragmentation result from chance encounters of this nature, but it also occurs when the drop of water in which the colonies are being examined begins to evaporate. The changes which occur come on very gradually. One first notices that the cells of the colony begin to swell so that they push each other apart, the colony becoming

three or more times as large as normal (Fig. 4). As swelling increases the activity of the colony decreases and finally ceases. If fresh water is added the colony takes on renewed activity, but usually only for a short time before the cells break apart and swim about independently and quite actively. If drying is allowed to continue, or if the water in which the colonies occur is kept in closed containers, the colonies invariably enlarge greatly and then the cells burst, there being left the most inconspicuous trace of fine particles and no sign of any cell wall. Just before this bursting occurs the cells become badly distorted and irregular.

All attempts to preserve specimens of this alga failed. The invariable result of contact with the many preservatives used was complete disintegration of the colonies and bursting of the cells.

While examining the material from this pool, the writer's attention was drawn to another alga which was present in considerable numbers. This was *Actidesmium Hookeri* Reinsch, another infrequently encountered green alga. This alga is considered by algologists to be a member of the Characiaceae, a family of the order Chlorococcales of the Chlorophyceae. In this country one species has been recorded from California by Smith (3). This species has been reported several times in Europe, where a second species, *Actidesmium globosum*, has also been found.

In the present collection, specimens of *Actidesmium* are quite numerous, occurring among various filamentous algae. The colonies vary considerably in size and in the number of cells, which ranges from small specimens containing only two groups of four and five cells each, to large colonies composed of twenty or more groups, each containing five to eight (or more) cells. (Fig. 5–7).

The cells vary greatly in size and shape. In the majority of the specimens examined, the cells are spindle-shaped objects 17–20 μ long and 4–10 μ in diameter, long, acute, pointed at the attached end and bluntly rounded at the free end. In other specimens the cells are more nearly globose and 12 15 μ in diameter. Several cases were observed in which early stages of zoospore formation existed (Fig. 6).

In view of the apparent rarity of the algae herein mentioned it seems worthwhile to note their occurrence in this locality. It may be that they are of more common occurrence than is supposed, but are not found because examination of the material collected is postponed until too late to observe them.

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(3). Smith, G. W.—Freshwater Algae. (1933).
(4). Stokes, A. C.—Notes on new freshwater Infusoria. Proc. American Phil. Society **23**: Infusoria (1886). pp. 562–568.
(5). Tiffany, L. H.—The Plankton Algae of the West End of Lake Erie. Franz Theodore Stone Lab. Contr. No. 6 (1934) 1–113. 15 pl.

Description of Figures

Figures 1–4. Cyclonexis annularis Stokes. 1 a, b. Vertical and lateral aspects of normal colony, 2 a–e; fragments of colonies which have been repeatedly "attacked" by small animals. 3 a, b. Reduced colonies re-forming after a normal colony has been broken by encounters with animals. 4. A small colony in which the cells are enlarging as drying occurs.

Figures 5–7. Actidesmium Hookeri Reinsch.

Figures 1, 5, 6, & 7 are drawn to scale a; 2, 3, 4 to scale b.

A Station for Cheilanthes alabamensis in Giles County, Virginia.—On July 8, 1938, while collecting with my class from the Mountain Lake Biological Station along the New River, in Giles County, Virginia, I came upon several plants of the Smooth Lipfern, *Cheilanthes alabamensis* (Buckley) Kunze.

The range of this species is usually given as Virginia and Missouri to Alabama, Arizona and Mexico. Its occurrence in Virginia has been based solely upon collections made many years ago in Lee County, where it is said not to have been found recently. Some doubt has been expressed as to whether the plant still exists at this locality. Dr. E. T. Wherry tells me that during the summer of 1938 he spent an entire day in a diligent but fruitless attempt to relocate it on the cliffs of the Powell River in Lee County, where it is believed that the original Virginia specimens were collected. If *Cheilanthes alabamensis* no longer grows in Lee County then the locality here reported may well be the only one now known within the state. At least, it represents a range extension to the east-northeast of about 140 miles.

The present find was made on the calcareous bluffs along the east bank of the New River, about a mile and a quarter north of the town of Ripplemead or one-half mile northwest of the railroad station at Klotz. Here, high up near the crest of the cliffs overlooking the river

and some extensive limestone quarries, the fern was discovered, growing on the perfectly bare cliff-face.

The flora of these cliffs is indeed an interesting one. Associated with the *Cheilanthes* on the bare rock ledges are two other lime-loving ferns, *Asplenium cryptolepis* Fernald and *Pellaea glabella* Mett. The predominant herbaceous vegetation includes *Draba ramosissima* Desv., *Sedum Nevii* Gray, *Brachychaeta sphacelata* (Raf.) Britton, *Aster oblongifolius* Nutt., *Rudbeckia triloba* L., *Polymnia canadensis* L. and *P. uvedalia* L.—all pronounced calciphiles. The characteristic tree on the summit of the bluffs is *Quercus Muhlenbergii* Engelm.; and a trio of shrubs to be looked for on all such calcareous formations throughout this area (*Rhus canadensis* Marsh., *Ptelea trifoliata* L. and *Zanthoxylum americanum* Mill.) is here present. This entire assemblage of species, to which many more might be added, is so characteristic a feature of almost every calcareous bluff along the New River as to engender the hope that further careful exploration of similar habitats may yield additional stations for *Cheilanthes alabamensis* in this and adjacent counties.

Specimens of the present collection (Fogg No. 14861) are being deposited in the Gray Herbarium and the herbaria of the University of Pennsylvania and of the Mountain Lake Biological Station.—John M. Fogg, Jr., University of Pennsylvania.

Spiranthes michuacana in Arizona.—Recently, while working up the *Spiranthinae* of Mexico for an orchid flora of that country, a specimen of *Spiranthes michuacana* (La Llave & Lexarza) Hemsley from Arizona was found among the undetermined specimens in the Gray Herbarium. The species does not seem to have been reported previously from the United States although it is not surprising to find it in Arizona. The plant ranges from the states of Oaxaca, Guerrero and Puebla to Sonora and Chihuahua in Mexico with its northern limit in Arizona.

Arizona: Hermitage of Rucker Valley, September 1881, *Lemmon 477*.

The same collection in the Kew Herbarium has the locality as "Huachuca Mountains."—Louis O. Williams, Harvard University.

Certain Plant Records from Hillsboro, New Hampshire; a Correction.—By some accident, an only partially corrected galley of

Dr. Blake's and my article with the above title was sent to the printer; and, because of absence from Cambridge, I did not see the final proof. In consequence, two alterations which should have been made were omitted from the paper as it appeared in RHODORA for January, 1939. They are as follows.

Dr. Baldwin has expressed doubt as to the accuracy of the data of collection accompanying certain specimens. Accordingly, the sentence on page 35 reading, " . . . the list and the herbarium contain the following authentic records . . . " should read, " . . . the list and the herbarium contain the following apparently authentic records . . . "

The author-citation for *Ampelopsis brevipedunculata*, also on page 35, should be (Maxim.) Trautv., not Koehne as published.—C. A. WEATHERBY.

OXYPOLIS **Canbyi** (Coult. & Rose), comb. nov. *O. filiformis canbyi* Coult. & Rose in Contrib. U. S. Nat. Herb. vii. 193 (1900).

The local plant of Delaware, isolated from the more southern *Oxypolis filiformis* (Walt.) Britton by the breadth of eastern Maryland, Virginia and much of North Carolina, differs not only in the remarkably distinct fruit, pointed out by Coulter & Rose, but in the much less developed stipular sheaths of the more delicate leaves. In *O. filiformis* the quill-like lower leaves are 3–6 dm. long, with sheathing bases 0.5–1.8 dm. long; in *O. Canbyi* the lowest and very slender leaves are 1–2 dm. long, with dilated sheaths only 0.5–1 cm. long. This marked difference in the foliage, added to the wholly different fruit, clearly separates the local *O. Canbyi*.—M. L. FERNALD.

THE ASTERISK IN LINNAEUS' SPECIES PLANTARUM.—Since some citations in *Species Plantarum* are followed by an asterisk, it is important to know what this sign means. The use was presumably explained by Linnaeus himself in the preface of the second edition:

> DESCRIPTIONES* tantum in obscuris adhibere necessum fuit, easque sine ambagibus, ut obtinerem compendium tironibus gratum.

The asterisk was omitted in the first edition. This paragraph was translated by Sprague and Exell[1] as follows: "Only in doubtful cases was it necessary to cite descriptions, and those, straightforward ones, so that I might keep the handbook suitable for beginners," and

[1] Journ. Bot. lxxv. 78 (1937).

by Furtado:[1] "Only in the case of obscure plants was it necessary to indicate with an asterisk such descriptions as were straightforward, so that I might keep the *compendium* suitable for beginners." "*Compendium*" is explained by Furtado, I believe not correctly, as the "list of synonyms or citations, *i. e.* the synopsis of the species under consideration." I agree with the translation by Sprague and Exell, except that I should substitute the word "add" for "cite." But Linnaeus himself gave an explanation of his use of the asterisk in *Philosophia Botanica* 255 (1751): "In completo Synonymorum cohorte *Inventorem* Asterisco notare placet." [In a complete list of synonyms it is well to note the inventor[2] by an asterisk.] In *Genera Plantarum* Linnaeus used the asterisk after generic names to indicate that he had seen a living plant of the genus, but that usage evidently has nothing to do with the case under discussion. I venture the opinion that the asterisk after "Descriptiones"[3] had reference to a footnote which was never published. There seems to be no connection whatever between that asterisk and the one used in the citations.—H. K. Svenson, Brooklyn Botanic Garden.

[1] Gardens' Bull. Straits Settlements ix. 311 (1937).

[2] i. e. the first describer.

[3] By this term I believe Linnaeus had reference to added descriptive notes and not to mere citations.

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JOURNAL OF

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CONTRIBUTIONS TO THE FLORA OF ALASKA*

A. E. Porsild, National Museum of Canada

(Plates 461–464)[1]

During the summer of 1926 the writer made a journey through Alaska, accompanied by his brother, Mr. R. T. Porsild. The trip was made on behalf of the Dominion Government for the purpose of studying the reindeer industry in Alaska, particularly reindeer grazing in different sections of that country and the reindeer industry in relation to the economy of the native population.[2]

Although botanical collections and field notes were made whenever and wherever time and opportunity permitted, the collecting of plants was purely incidental. For this reason and because the primary objective took up most of our attention, the time which could be devoted to botanizing and to the caring for the collections was always very limited, and in but very few localities were we able to do justice to these pursuits. During the early part of the journey many species, particularly in *Gramineae*, *Cyperaceae* and *Compositae*, were too immature for identification.

The following notes on the flora of Alaska, and the catalogue of species collected or observed in the course of our journey, for the above reasons must of necessity be regarded as incomplete. In view of the paucity of botanical collections, particularly from the interior of Alaska, and especially in view of the comprehensive Flora of Alaska, now in preparation by Dr. Eric Hultén, the writer feels that it

* Published by permission of the Director, Mines and Geology Branch, Department of Mines and Resources, Ottawa, Canada.

[1] Illustrations and extra pages published at expense of author.

[2] A. E. Porsild, Reindeer Grazing in Northwest Canada, Department of Interior Publ. 1929, pp. 1–46.

is justified and desirable, at this time, to make the collection available to the public.[1]

A great deal of collecting yet remains to be done before the flora of Alaska may be said to be even tolerably well understood and the mountain regions, particularly those of the Bering Sea and North Alaska, may be counted upon to yield a large number of important finds. That this is so is amply borne out by the fact that our collecting, made hurriedly wherever the principal objective of our journey happened to take us, added so many new records to the flora of Alaska.

In all 648 species, including such subspecies and varieties as appear to have a distinct geographical range of their own, are listed in the catalogue at the end of this paper. Minor varieties or forms having a geographical distribution congruent with that of the species are not included in this figure.

Of these 648 no less than 10 species[2] and 2 varieties are new to science, 4 are new to the flora of North America, 93 appear not to have been recorded previously from Alaska, 62 have not previously been recorded in Alaska from north of the Pacific coast and the Aleutian chain and 19 were previously known from the Bering Sea region but not from the interior of Alaska.

Of the 648 species and major varieties 27 are *Pteridophyta*, 5 are *Gymnospermae*, 172 *Monocotyledoneae*, 278 *Archichlamydeae* and 166 *Metachlamydeae*.

The catalogue is primarily a list of the plants collected by the writer and his brother and no attempt has been made to include or to discuss in it all species recorded in literature from central Alaska. In the catalogue have been incorporated, however, a number of unpublished records of plants collected by others from the region through which we travelled. The most important of these collections is one of 243 plants made in 1925 by Mr. Hamilton M. Laing of Comox, British Columbia, when a member of the Mt. Logan Expedition, from the St. Elias Range, near the head of Chitina River in S. E. Alaska, in approximate latitude 61° N.[3]

[1] For a list of the vascular plants of Little Diomede Island, Bering Strait, see A. E. Porsild, Trans. Royal Soc. Can. ser. 3, sect. 5, **33**: 21–38 (1938).

Lichens and some mosses were collected also and a list of lichens from Alaska is now being prepared by Mrs. Lucy C. Raup, Jamaica Plain, Mass. A list of the Bryophyta collected on Little Diomede Island was published by Wm. C. Steere, Am. Midl. Nat. **19**, 2: 436–439 (1938).

[2] Of these, *Potamogeton Porsildiorum* Fern. and *Draba exalata* E. Ekm. have been described elsewhere.

[3] For an account of the expedition see Can. Alpine Journ. **15**: 1–127 (1925). On pp.

Some notes have been incorporated from a collection of plants from Seward Peninsula, Alaska, made over a period of years by Mr. Charles Thornton of Nome, Alaska; also a number of unpublished records have been included, chiefly from the United States National Herbarium, from the region visited by us. No attempt has been made, however, to cite in the catalogue all specimens from the region visited, seen by the writer in the various herbaria visited by him, and the only records added from such sources are such as fill in gaps in his own collection or records of critical species discussed in the text.

Our collection totals 1730 numbers of vascular plants with a total of 8000 sheets. A complete set including all types and unicates, is deposited in the National Herbarium of Canada, Ottawa.

Acknowledgements

The writer wishes here to express his sincere gratitude to a number of people who in one way or another greatly assisted in this work. First of all to his brother, Mr. R. T. Porsild, to whose untiring efforts and keen enthusiasm it is due that, often in the face of great difficulty and adverse conditions, it was possible to bring back so large and representative a collection from a region botanically largely unknown.

To his father, Dr. Morten P. Porsild, Director of the Danish Arctic Station, Disko, Greenland, the writer is particularly indebted, not only for his untiring and stimulating interest in the progress of the work and for many valuable suggestions, but above all for the painstaking compilation and preparation of a manuscript pocket flora, containing brief descriptions and keys to all species which, previous to 1926, had been reported from arctic and boreal northwest America. This pocket flora, in two volumes, proved of immense value in the field, when, due to the great difficulties of transportation, none but the most indispensable handbooks could be carried.

To the late Dr. M. O. Malte, Chief Botanist, National Museum of Canada, the writer is indebted for much valuable advice and for his unfailing encouragement.

To Dr. R. M. Anderson, Chief of the Division of Biology, National Museum of Canada, the writer is grateful for much encouragement and for supplying valuable information about northwest Alaska.

To Mr. L. J. Palmer, United States Biological Survey, Juneau, Alaska, formerly Biologist in charge of Reindeer Grazing Investiga-

99–114 Mr. Laing under "Wild Life of the Upper Chitina" makes a number of observations on the vegetation.

tions, with headquarters at Fairbanks, Alaska, the writer is indebted for generous hospitality while at Fairbanks and for much valuable advice. The writer spent about one month with Mr. Palmer and accompanied him on a number of field trips. During these Mr. Palmer freely placed his intimate knowledge of the reindeer industry, grazing problems and local conditions in general at the disposal of the writer.

To Mr. Charles Thornton, United States Commissioner and Mining Recorder, Nome, Alaska, and a keen and enthusiastic collector of plants, the writer wishes to express his gratitude for being permitted to examine and make use of his important collection of plants from the vicinity of Nome.

To the curators and staffs of a number of herbaria, notably the Gray Herbarium, Harvard University, Cambridge, Mass., the herbarium of the Arnold Arboretum, Jamaica Plain, Mass., the United States National Herbarium, Washington, D. C., New York Botanical Garden, Bronx Park, New York, and the Botanical Museum of the University of Copenhagen, the writer is deeply indebted for making their material of Alaska plants available for study.

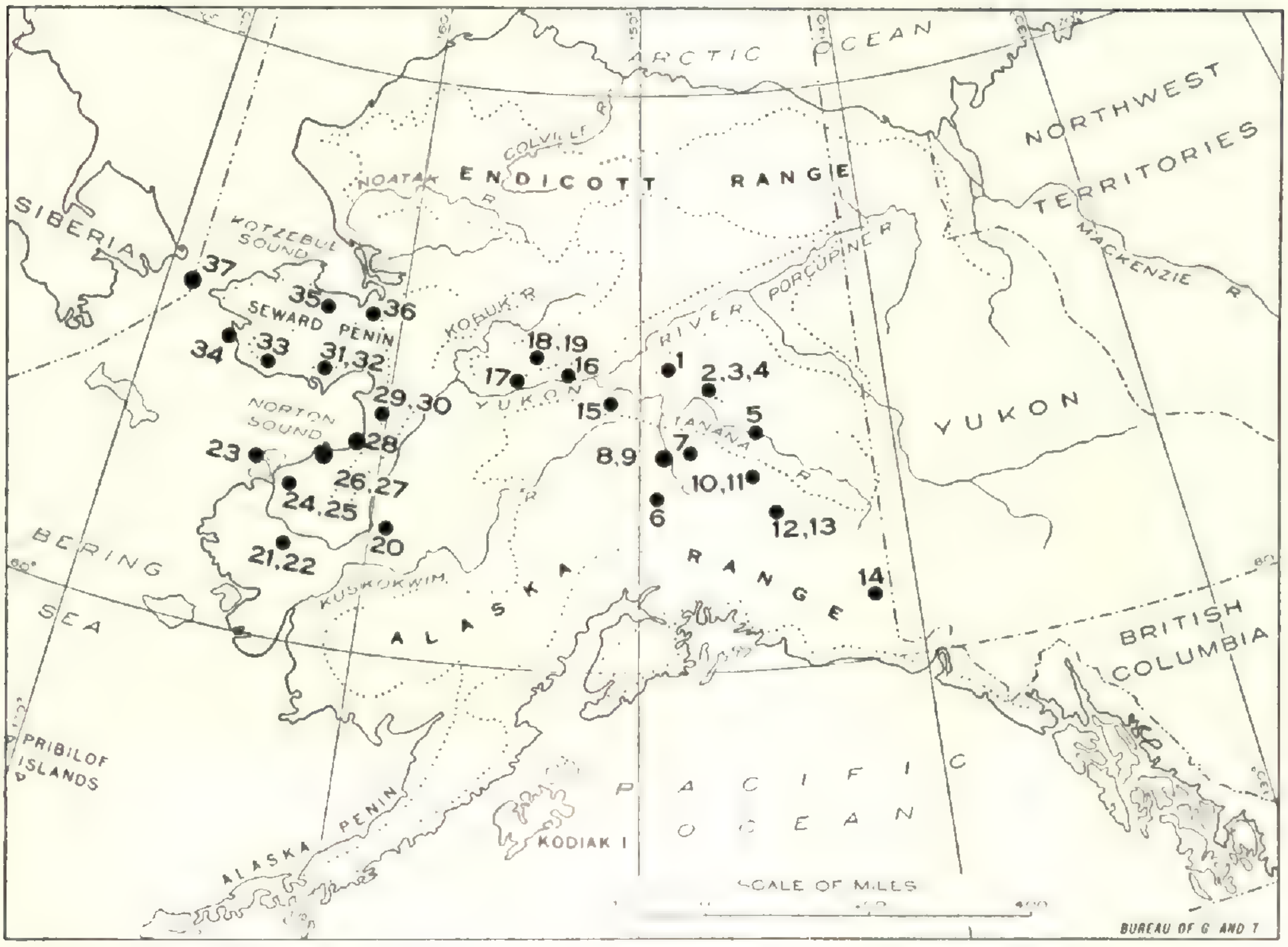
The writer particularly wishes to thank Professor M. L. Fernald and Mr. C. A. Weatherby of the Gray Herbarium for checking nomenclature and for many helpful suggestions and much stimulating encouragement during several prolonged and most profitable visits to that institution. To Dr. Hugh M. Raup of the Arnold Arboretum the writer is indebted for numerous suggestions and for critically reading the manuscript.

The writer further wishes to express his appreciation to the following botanists who have examined or determined critical genera in the collection. Mrs. Agnes Chase, United States National Herbarium (*Poa leptocoma* and *gaspensis*), Dr. Carl Christensen, Copenhagen (*Polypodiaceae*), the late Dr. H. Dahlstedt, Stockholm (*Taraxacum*), the late Mrs. Elizabeth Ekman (*Draba*, part of collection only), Professor M. L. Fernald, Gray Herbarium, Harvard University (*Potamogeton* and *Arnica*), Dr. B. Floderus, Stockholm (*Salix*), Professor Marie-Victorin, University of Montreal (*Lycopodium*), Dr. Hugh M. Raup, Arnold Arboretum, Harvard University (*Salix* and *Betula* in part), and Professor G. Samuelsson, National Herbarium, Stockholm (*Luzula* and *Epilobium*, part of collection).

Itinerary of Expedition

The party left Ottawa May 20th, 1926, for Seattle, Washington, where passage was booked on the S. S. Yukon. On June 5th we landed at Seward, the main port of entry to the interior of Alaska and the southern terminus of the Alaska railroad.

Enroute to Fairbanks a few days were spent at Broad Pass in the Alaska Range in order to observe a small reindeer herd brought there from Goodnews Bay in the Kuskokwim district of southwest Alaska, by the United States Government for experimental purposes.



Broad Pass, *June 8–11*

We got off the train at a place locally known as Cantwell which consists merely of half a dozen log cabins and a railroad shed. It is situated in the Broad Pass Valley, a short distance south of the extreme east corner of Mount McKinley National Park, in latitude 63° 26′ N. and longitude 149° W., just north of the divide 2100 feet above sea level.

The west side of the valley is treeless while the eastern side carries a mixed forest of *Picea glauca, Betula papyrifera* var. *neo-alaskana* and *Populus tacamahacca.* Along a small river were thickets of *Alnus*

crispa with a number of species of willow amongst which was noted *Salix alaxensis.*

The forest floor in most places was formed of a heath composed of *Betula glandulosa, Potentilla fruticosa, Vaccinium uliginosum* and *V. Vitis-Idaea, Rhododendron lapponicum* and *Ledum groenlandicum.* Coming from the moister south slope of the Alaska Range the total absence of wood ferns was very noticeable. Instead we found a rather xerophytic flora in which the most common species were *Lycopodium annotinum, L. clavatum* and *L. complanatum, Equisetum arvense, Festuca brachyphylla, Hierochloë alpina, Calamagrostis canadensis, Carex atrosquama* and *C. angarae, Luzula multiflora, Cerastium Beeringianum, Stellaria longipes, Draba glabella* and *Dr. aurea* and, to our great surprise, in tall spruce woods *Eutrema Edwardsii,* which we were accustomed to think of as a high-arctic species; also *Saxifraga cuspidata, Rubus Chamaemorus* and *R. acaulis, Astragalus frigidus* var. *littoralis, Lupinus arcticus, Empetrum nigrum, Pyrola grandiflora* and *P. secunda* var. *obtusata, Linnaea borealis, Antennaria isolepis,* the latter not before recorded from Alaska, and *Artemisia hyperborea.* In the drier places the forest floor was covered with a thick carpet of cladonias.

In wet places near a small brook we collected, for the first and only time during the expedition, *Adoxa Moschatellina,* not previously recorded from Alaska. Here also grew *Anemone Richardsonii, Rhodiola integrifolia* and *Cardamine purpurea.*

Upland Benches

From the valley several miles broad, the mountains on either side rise in a series of curious terraces, no doubt formed, following the successive retreats of the glacier, by river erosion through a thick mantle of glacial gravels of great magnitude. The terrace slopes are densely forested while the benches are essentially treeless and covered with a rather wet, meadow-like tundra. Isolated clumps of spruce, accompanied by willow and alder, are found only where small mountain streams have cut through the terraces.

On these benches the vegetation was less advanced than in the valley or on the upper slopes. Grass-like species predominate but few were sufficiently far advanced for collecting. *Arctagrostis latifolia, Hierochloë alpina, Eriophorum opacum* and *E. Scheuchzeri, Carex rariflora* and *C. saxatilis* and *Luzula confusa,* however, were readily

identified. Low willows and prostrate *Betula glandulosa* were also common. One of the most conspicuous plants of the wet benches, at the time of our visit, was *Polygonum Bistorta*, the pretty, pink spikes of which stood up ten or twelve inches above the ground. Fairly common also were *Claytonia sarmentosa*, *Cardamine purpurea*, *Eutrema Edwardsii*, the latter already in fruit, whereas in the spruce forest in the valley it had been in flower. Of saxifrages, *Saxifraga hieracifolia*, *S. Hirculus*, and *S. punctata* were equally common while *Parnassia Kotzebuei* and *Chrysosplenium tetrandum* were seen but occasionally, the latter already with mature seed. *Rubus Chamaemorus* was common here as elsewhere and so were *R. acaulis* and *Potentilla fruticosa*. Of the *Leguminosae* only *Astragalus alpinus* and *Hedysarum alpinum* var. *americanum* were seen. *Epilobium latifolium* and young plants of *E. davuricum* were common in sandy places. Members of the heath family were rather scarce, represented chiefly by *Cassiope tetragona*, *Vaccinium Vitis-Idaea*, *Oxycoccus microcarpus* and *Ledum decumbens*. Near a brook the exquisite *Dodecatheon frigidum* was just coming into bloom. In wet heath we also saw *Pedicularis Langsdorffii*, *P. capitata*, *P. sudetica* and *P. labradorica*. Very few of the *Compositae* were out and but two, *Petasites frigidus* and a *Taraxacum*, were common.

Alpine Slopes

The flora of the valley bottom and the terraces had been a curious mixture of boreal and arctic species, but above 3,000 feet the arctic-alpine flora dominated. On many of the slopes solifluction appeared to be of common occurrence and in some places land slides had descended all the way to the valley floor, carrying with them masses of vegetation. Evidence of solifluction, some of even greater magnitude, had been in evidence in many places along the railroad through the Alaska Range.[1]

On the upper slopes on dry, gravelly ridges grew *Festuca brachyphylla*, *Elymus innovatus*, *Lloydia serotina*, *Zygadenus elegans*, *Salix reticulata* and *S. pseudopolaris*, *Polygonum Bistorta*, *Arenaria macrocarpa* and *A. verna* var. *pubescens*, *Draba nivalis*, *Dr. lanceolata* and the Cordilleran *Dr. densifolia*, not previously recorded from north of Alberta. Common also were *Potentilla uniflora*, *Dryas octopetala*, *Arctostaphylos alpina*, *Diapensia obovata* and *Androsace Chamaejasme*.

[1] See Stephen R. Capps, The Kantishna Region, U. S. Geol. Surv. Bull. 687, reference on pages 66–70, Washington 1919.

Numerous large snow drifts still remained on the upper slopes, supplying abundance of moisture to herb-mats and alpine meadows. In such places we saw *Anemone narcissiflora, Ranunculus nivalis, Parrya nudicaulis, Draba aurea, Boykinia Richardsonii, Androsace septentrionalis, Gentiana glauca* and *Pedicularis Langsdorffii.*

On a rocky crag near the summit we added two species to our list, both new to Alaska. They were *Erigeron radicatus* and *Antennaria subcanescens.*

Goldstream Creek and Pedro Dome, *June 13th*

From our temporary headquarters at Fairbanks several profitable excursions were made by motor car in the vicinity. One, to the hills north of Fairbanks was of particular interest. A narrow, winding road for some distance followed the valley of Goldstream Creek. In the creek-bed a couple of gold dredges were in operation and the valley floor in most places had been disturbed by their operation. A couple of small ponds yielded rich returns of aquatic plants, including *Potamogeton pusillus, P. tenuifolius* and a new species, recently described as *P. Porsildiorum* Fernald; in addition *Ranunculus Purshii* ssp. *yukonensis* and *Callitriche verna.* The ponds all teemed with animal life, including frogs, water beetles and several kinds of *Crustacea.*

After a steep climb through dense spruce woods the road finally reached the plateau, where, about 40 miles from Fairbanks, at an altitude of 2,600 feet, we stopped to collect. The low, rounded hills appeared to be covered by glacial till through which protruded bosses of soft schists. On the cliffs we noticed *Dryopteris fragrans, Cystopteris fragilis, Hierochloë odorata, Carex glacialis, Artemisia arctica, Antennaria alaskana* and *Crepis elegans,* the latter not heretofore recorded from Alaska.

The rather dry, wind-swept, treeless plateau was covered by a low but dense heath composed chiefly of *Betula glandulosa, Empetrum nigrum* and *Vaccinium uliginosum.* Here and there in the heath were low, prostrate cushions of white spruce. Scattered irregularly over the plateau were semi-barren gravel plains, apparently too sterile to support a closed heath formation. Here grew in great abundance *Tofieldia nutans,* new to the interior of Alaska, *Lycopodium Selago, Salix phlebophylla, Empetrum nigrum, Diapensia obovata, Loiseleuria procumbens* and *Campanula lasiocarpa.*

Below the summit of Pedro Dome, sheltered from the effect of the wind, the upper slopes were covered with an open, park-like forest in which the dominant trees were white spruce and paper birch. The soil here was sandy but, nevertheless, supported a comparatively rich forest flora. Here for the first time, in addition to *Lycopodium annotinum*, *L. clavatum* and *L. complanatum*, we saw *L. obscurum*. Other dominant species were *Spiraea Beauverdiana*, *Cornus canadensis*, *Lupinus arcticus* and *Salix Bebbiana*. Of less importance, but also in full bloom, *Corydalis sempervirens*, *Pyrola grandiflora* var. *canadensis*, *Arnica Louiseana*, the last two not heretofore recorded from Alaska, and *Antennaria isolepis*.

PICEA MARIANA SWAMPS, *June 14*

Travelling east along Richardson Highway we spent an afternoon collecting in the low, muskeg-covered flats of the Tanana Valley. The dominant species of the lower ground was *Picea mariana*, 20 to 30 feet high, with a dense undergrowth of *Alnus crispa*, *Salix Bebbiana*, *S. myrtillifolia* and other willows, *Ledum groenlandicum*, *Chamaedaphne calyculata* and other ubiquitous heath species.

In one or two places, where recent road construction had cut through the top soil, we noticed that the humus layer in the muskeg was comparatively thin and that no true peat deposits existed. The subsoil everywhere appeared to be alluvial clays and loam, here and there with beds of water-transported gravels.

In low places occupying former river channels occurred the usual marsh vegetation in which *Carex rostrata*, *Eriophorum angustifolium* with *Equisetum limosum* and *Iris setosa* were the dominants. In addition we saw *Geocaulon lividum*, which later proved to be common in the interior, and *Equisetum palustre*, *Carex aurea*, *C. disperma*, *C. concinna* and *C. leptalea* and *Ranunculus Macounii*, the last six all new to Alaska.

Along a low, calcareous ridge which crossed the bog, carrying an open growth of *Populus tacamahacca* and *P. tremuloides*, we saw a number of orchids, amongst which were *Habenaria hyperborea* and *H. obtusata*, *Spiranthes Romanzoffiana*, *Goodyera repens*, *Corallorrhiza trifida* and *Listera borealis*, the last also new to the flora of Alaska. Other interesting species, the last two likewise new to the flora, were *Pyrola chlorantha*, *Erigeron elatus* and *Antennaria anaphaloides*.

Nenana Valley, *June 18–21*

On June 17 my brother had gone down the Yukon to attend a reindeer round-up in the Kokrines Mountains where he spent the latter part of the month and the first week of July, later to join me again at Pastolik on the coast. At the time of our visit to the Broad Pass region the season had been too early for a number of species so, when an opportunity presented itself for a second visit, the writer went south on the Alaska Railroad, this time to Healy at the north end of Broad Pass, just east of Mt. McKinley National Park.

The slopes of the Nenana Valley west of Healy are covered by a thick mantle of till through which few outcrops of schists and gneisses are seen. To the east of the river the formation changes to one of high bluffs of sandstone and shale containing numerous beds of lignite.

The vegetation of the benches west of Healy is very similar to that of the terraces at Broad Pass, except, perhaps that on the whole it appears to be more xerophytic. On low, windswept ridges I saw *Selaginella sibirica*, and, at much lower levels than at Broad Pass, *Elymus innovatus*, accompanied by *Agropyron latiglume* and *Bromus Pumpellianus*.

Outside the river valley water is rather scarce and from a point 2000 feet above the river but few brooks and lakes could be seen. A spring with beautifully clear and cold water issued at the foot of one of the upper benches and along its course a varied and quite luxuriant vegetation was found. Amongst tall white spruce and poplars grew *Boschniakia rossica*, parasitic on the roots of spruce and alder. On the forest floor also were *Dryopteris austriaca* and *Dr. Linnaeana*, *Cystopteris montana*, the latter not known heretofore from Alaska outside of Seward Peninsula. There were also *Botrychium Lunaria*, *Corallorrhiza trifida*, *Orchis rotundifolia*, *Trientalis europaea* and many others. In wet moss by the spring grew *Selaginella selaginoides*, *Habenaria obtusata* and *H. hyperborea*, *Arenaria humifusa*, *Pinguicula vulgaris* and *Primula egaliksensis*. On a gravelly slope near the spring I saw the sweet-scented *Elaeagnus commutata* and *Hedysarum Mackenzii*, both new to the flora of Alaska, and *Shepherdia canadensis*.

Mountains between Healy and Moody Creeks, *June 19–20*

Time did not permit an ascent of some of the high mountains of the region and I had to content myself with climbing a peak well over 4000 feet high, northeast of Healy. Walking along the wooded lower

slopes was tiresome because of a luxuriant *Vaccinium-Ledum* heath growing in an almost knee-deep, soft, moist sphagnum carpet in which grew *Oxycoccus microcarpus* and *Pinguicula villosa*, *Andromeda Polifolia*, *Tofieldia palustris*, *T. coccinea* and others. In a ravine or small mountain valley which I followed for a short distance was found a mesophytic forest of *Populus tacamahacca* and *P. tremuloides*, *Betula papyrifera*, *Alnus crispa*, *Salix alaxensis* and *S. arbusculoides*, *Cornus stolonifera* and *Viburnum pauciflorum*. In mosses on the forest floor grew *Ranunculus lapponicus*, *Anemone Richardsonii*, *Cornus canadensis*, *Pyrola minor*, *Polemonium acutiflorum* and many others. Leaving the forest, which on the south slopes reaches to 3,000 feet,[1] a gravelly ridge was followed to the top.

On the dry, shaly slope, through which outcrops of shale protruded, *Dryas octopetala* perhaps was dominant, with *Carex obtusata*, *Luzula confusa*, *Potentilla uniflora* and *Oxytropis podocarpa*. In shady crevices of rock grew *Cystopteris fragilis* and *Saxifraga oppositifolia*.

The climb had not been difficult but very tiresome because of the oppressive heat and the unbelievable number of mosquitoes and black flies but, upon reaching the moist, alpine slopes near the summit, my labours were abundantly rewarded, for here grew a number of rare plants which I had not seen before and some which I was not to collect elsewhere in Alaska. Rarest and new to the flora of America was *Claytonia Eschscholtzii*, with large, showy white flowers and a strong tap-root as thick as a man's thumb; with it grew small tufts of the shiny-bristled *Eriophorum callitrix*, in Alaska previously recorded only from Port Clarence, Seward Peninsula, and *Carex atrofusca*, also much beyond its previously known range. Other interesting species of the alpine slopes were *Kobresia bipartita*, *Habenaria obtusata*, *Boykinia Richardsonii* and *Eutrema Edwardsii*. On gravelly places grew *Arenaria macrocarpa* and *A. arctica*, *Oxyria digyna*, *Oxytropis pygmaea*, *Saxifraga Hirculus* var. *alpina*, *Primula egaliksensis*, *Androsace Chamaejasme*, *Pedicularis capitata* and *Antennaria subcanescens*.

Night overtook me on the summit and for several hours it was too dark to collect. When looking for a suitable shelter to rest for a few hours I walked between some large rocks near the summit. Turning a corner I almost stepped on a very large, brown animal. My heart

[1] Capps, l. c., on p. 15 states that the timber in the Kantishna region, generally speaking, is limited to areas below 3,000 feet, but that he had seen single trees (presumably spruce) at an elevation of 3,700 feet.

stopped for a fraction of a second when I remembered the numerous yarns about the ferocious grizzly bears of the Alaska range. My host at the roadhouse at Healy had regaled me the night before with these tales in his endeavour to make me carry his heavy army rifle. Suspecting that he had been "pulling my leg" I had courteously, but firmly, declined and now was unarmed, save for my large hunting knife used for digging plant specimens. The situation, which at first had seemed desperate, unexpectedly solved itself when the "monster grizzly" reluctantly parted into eight fat, grunting porcupines that had been feasting on the dried-up remains of a mountain sheep.

At 2 a. m., refreshed by a short sleep, I again took up the collecting, adding many more specimens to the contents of my already bulging vasculum. The early morning hours were unforgetable. Through a thin mist the sun rose over the glacier-capped peaks of Cathedral Mountain and Mt. Hayes to the east, while to the west Mt. McKinley in its 20,000 foot majesty towered supreme above the mist, tinted pale rose by the early rays of the rising sun.

Richardson Highway

From June 24 to 28, in the company of Mr. Palmer of the Biological Survey, a trip was made by motor car over the then recently opened Richardson Highway between Fairbanks and the seaport Valdez, at the head of Prince William Sound. For about 75 miles the road follows the north and east bank of the Tanana River through much the same type of country as that visited on June 14th. At McCarty, near its junction with Delta River, we crossed the Tanana by a primitive cable ferry and then followed the east bank of the Delta River. For what seemed endless miles the road crossed an almost level, sandy plain covered by scrubby white and black spruce, paper birch and larch. Save for the rough, sandy road and the almost straight line of three-legged telegraph poles nothing broke the monotony.

Along the roadside where recent road construction had disturbed the native vegetation the exposed sandy loam of the plain supported a rank growth of grasses and weeds. Some were indigenous but evidently brought here with native hay, while others obviously were introduced with fodder imported for the horses used by the road-crews, but now rapidly becoming established. Along the highway we saw in such places *Agropyron Smithii*, *Bromus Pumpellianus*, *Avena sativa*, *Hordeum jubatum*, *Phleum pratense*, *Deschampsia cespitosa*, *Calama-*

grostis inexpansa, Trifolium hybridum, Gentiana procera, new to the flora of Alaska, and *Senecio lugens.*

Whether or not the ground on the level plain was permanently frozen could not be ascertained, but the universal use, here as elsewhere in central Alaska, of the tripod type of telegraph pole, strongly suggests the presence of permanent frost close to the surface.

Fifty miles south of McCarty we left the level plain and began to climb the northern spurs of the Alaska Range. The gentle slopes that here had the appearance of a system of old moraines or eskers bore a monotonous *Picea mariana-Larix laricina* muskeg, not very different from that of the flood plain, while the higher ridges were largely treeless and covered by a luxuriant heath composed chiefly of *Ledum groenlandicum, Chamaedaphne, Deschampsia cespitosa* and tussocks of *Eriophorum opacum.* Numerous small pothole lakes or ponds occurred in the heath and were fringed by *Carex rostrata, Carex physocarpa, Eriophora* and *Equisetum limosum.* A few shallow lakes of a different type, with shallow sandy or muddy shores that probably dried out completely during the summer, were also seen. A yellow margin visible even at considerable distance surrounded these lakes and upon close inspection proved to be masses of flowering *Ranunculus reptans.* Near the water's edge we found the rare *Subularia aquatica,* new to central or northern Alaska, and *Alopecurus aequalis* var. *natans,* both in flower. Curiously enough we saw no *Hippuris vulgaris.*

The drive through the mountains was unforgetable. The road had just recently been opened to through traffic but signs warned the traveller to carry shovel and rope and to proceed at his own risk. In one place the road for a distance of six miles merely consisted of a narrow shelf 200 feet above the river, dug into the side of a gravel scree. Meeting another car here involved the excavation of a niche to permit the other car to pass.

PAXON, *June 26th*

Having crossed the divide we stopped at Paxon about fifteen miles south of the watershed. According to signs along the road the elevation here was 2700 feet above sea-level. On scanning the near hillsides through the field glasses the flora appeared promising and we at once recognized a number of southern types that we had not come across before, showing that we were getting into the mesophytic flora of the

Pacific slope. Most conspicuous were the pretty, purple *Geranium erianthum* and *Heracleum lanatum* six to eight feet tall.

Leaving the car we followed a small creek leading towards a mountain slope to the east. In wet moss along the creek we found large clumps of *Dodecatheon frigidum* and *Gentiana glauca*. The higher parts of the slope were covered with a very dense, but low scrub of ground birch, willow and scattered, stunted white spruce. On bare patches left by a fire ten years ago nothing much grew but the ubiquitous *Epilobium angustifolium*. Above 3,000 feet we saw no timber but instead found moist, verdant alpine meadows showing that the region was one of more abundant precipitation than the north slope.

Common in the alpine meadows were *Poa alpina*, *Carex podocarpa* and *C. macloviana*, *Luzula parviflora*, *Thalictrum alpinum*, *Aconitum delphinifolium*, *Sanguisorba sitchensis*, *Epilobium Hornemanni*, *Swertia perennis* and *Veronica Wormskjoldii*. Of particular interest was a dioecious mat-forming *Antennaria* which proved to be undescribed. Here and there in low birch thickets we saw large clumps of tall *Potentilla glaucophylla*, similar in habit and appearance to the Greenland endemic, *P. Ranunculus*, and not before recorded from Alaska; also *Ranunculus nivalis*, *Myosotis alpestris* var. *asiatica*, *Draba aurea*, *Viola biflora* and *V. Langsdorffii*.

A heavy downpour accompanied by fog prevented us from exploring the upper slopes. As we returned over the divide the rain stopped and we were again able to enjoy the grandeur of the scenery around Isabella Pass and Summit Lake. While doing that we nearly came to grief. The prolonged spell of hot weather which on one day at Fairbanks had sent the thermometer to 104° F. had caused exceptional swelling of the glacier-fed streams and one boisterous torrent had cut a 200-foot gap through the roadway. Retracing our course for a quarter of a mile we now saw a detour sign, scribbled in pencil on an empty milk box. The detour necessitated several crossings of turbulent, but luckily quite shallow glacial streams and, with one of us walking ahead to sound the depth of the water, we managed to get across safely with only the running-boards of the car awash.

Darkness overtook us at Miller, near a place where Castner Glacier reaches within a mile or two of the road. This place we had picked out the day before as the most "alpine" one seen along the road and one that promised a profitable day of botanizing.

Castner Glacier, *June 27.*

The weather looked promising the next morning so we got away to an early start following the glacier-stream in search of a ford. A few attempts soon convinced us, however, that the stream was much too deep and turbulent and, to make matters worse, the swift waters were full of small and large jagged pieces of ice. To reach the mountain it was necessary, therefore, to climb the glacier-tongue.

The alluvial fan near the glacier-tongue showed a rare mass of colour for here grew large clumps of *Epilobium latifolium* in full bloom and in some places patches of the pure white-flowered variety. With them were purple *Hedysarum Mackenzii* and *Aster sibiricus*, and on the higher gravel bars white-flowered *Dryas octopetala* and the magnificent yellow-flowered *D. Drummondii*, also the pale blue-flowered viscid *Oxytropis hudsonica*, the last two new to the flora of Alaska, and deep-blue *Lupinus arcticus*, pink *Silene acaulis* and yellow *Crepis nana*.

The glacier-tongue for a distance of about two miles was covered by moraines and had the appearance of being in rapid retreat. The glacier itself, therefore, was free from crevasses and was crossed without difficulty. On the fresh moraines, near the glacier, we saw *Melandrium apetalum*, *Saxifraga cernua* and *S. oppositifolia*, *Arenaria verna*, the Cordilleran *Cerastium Earlei*, which is new to Alaska, *Draba stenoloba* and *Dr. crassifolia*, both new to the interior of Alaska, and a number of other arctic-alpine species. On a south-facing scree, made fertile by a thick deposit of loess and fine wind-carried, decaying vegetable drift we found a luxuriant growth apparently not in the least affected by the proximity of the glacier.

Here at last we saw ferns in abundance. Most common were *Dryopteris austriaca* and *D. Linnaeana*, *Cystopteris montana* and *C. fragilis*, the last three restricted to moist shaded places; likewise *Botrychium Lunaria*, *Lycopodium annotinum*, *L. complanatum* and *L. clavatum*. The season was yet early for most sedges and grasses, and many were still too immature for study. We did recognize *Poa alpina* and its viviparous form, *Festuca brachyphylla*, *Phleum alpinum*, *Carex macloviana*, *C. angarae*, *C. scirpoidea*, *C. Lachenalii*, *C. Garberi* and the curious *C. capillaris* var. *nana*, with the terminal spikelet gynaecandrous; the last two both recorded from Alaska for the first time. In low birch thickets we saw for the first time *Streptopus amplexifolius* and in addition *Habenaria hyperborea* and *H. obtusata*,

Corallorrhiza trifida, *Pyrola minor* and many others. On rocky ledges above the slope grew numerous saxifrages, *Rhodiola intermedia*, *Gentiana aleutica*, *Antennaria isolepis* and also the new *Antennaria* from Paxon.

At midnight, with vasculums and packsacks filled to capacity, we returned to our tent. Next morning with deep regret and a wistful look back to Castner Glacier and its many unexplored possibilities we rolled up our tent and blankets. Time did not permit us to remain longer; the river steamer on which we had booked passage to the coast would sail from Nenana on July 1st and much was yet to be done at Fairbanks. Travelling the rest of the day and all next night, making frequent stops along the road to collect, we reached Fairbanks on June 29th. One stop was made at the north end of the pass opposite Rapids Glacier which has recently made itself famous because of its spectactular advance. The glacier-tongue was then barely visible from a low hill east of the road. Two species, both new to Alaska, were added to our collection from there. One was *Carex Williamsii*, growing in wet sphagnum by a brook, while the other, *Erigeron glabellus* var. *pubescens*, we collected on a gravel bar in the river.

College and Smith Lake, *June 29*

A day was spent visiting the recently completed University of Alaska, at College near Fairbanks. It was then known as the "Mining School and Agricultural College of Alaska," and a small suburb had grown up around the university campus. A couple of hours were spent in a small marsh near Smith Lake where a rich flora of marsh and aquatic plants was hurriedly explored. Some of the more interesting species were *Drosera rotundifolia*, *Nuphar variegatum*, *Sparganium hyperboreum*, *Utricularia vulgaris* var. *americana*, *Lysimachia thyrsiflora*, *Scutellaria epilobiifolia* and *Calla palustris*, the last four all new to Alaska. The lake was full of frogs and other aquatic life, while swarms of dragon flies were making but small inroads in the black clouds of mosquitoes that hovered over the marsh.

Yukon River to the Bering Sea Coast

On July 1st we embarked for the coast on the S. S. General Jeff. C. Davis, a small and rather obsolete-looking stern-wheeler that plies the Yukon between Nenana and Holy Cross and is all that is left of the once impressive fleet of river boats made superfluous when the rail-

road from Seward to Fairbanks was completed. Although the boat stopped every few hours to load firewood no collecting was done until we reached Holy Cross where a couple of days were spent waiting for the arrival of a small gasolene launch which carried mail and passengers between that place and St. Michaels on the coast.

At the Mission at Holy Cross, for many years maintained by an order of the Russian Orthodox Church, we saw large fields of potatoes almost in bloom and a small patch of oats that looked promising. Other vegetables, including cabbage, carrots, beets, peas and lettuce did well in the Mission gardens.

An afternoon was spent near a small lake. In a wet meadow which bordered the lake grew *Carex rostrata* and tall *Eriophorum angustifolium*, *Arctophila fulva*, *Glyceria grandis* and *G. nervata*, the last two new to the flora of Alaska, also *Thalictrum sparsiflorum* and *Lysimachia thyrsiflora*.

Near the water's edge in a wet cow-pasture grew *Galium tinctorium* var. *subbiflorum*, new to the flora of Alaska, and *Ranunculus Purshii;* in the shallow water *R. trichophyllus* var. *typicus*, *Potamogeton perfoliatus*, *Sparganium minimum* and *S. multipedunculatum*, *Utricularia vulgaris* var. *americana*, *Myriophyllum exalbescens;* and out in the deep water *Nuphar variegatum*.

Yukon Delta, *July 10–14*

Several days were spent at Kotlik in the Yukon Delta, weather-bound, with rain and a driving gale from the southwest. The country below Old Andreafski at the head of the delta, 80 miles above Kotlik, had been low and wet and quite devoid of tree-growth. Here at Kotlik the general surface was but a few feet above sea-level, full of shallow ponds and sloughs with stagnant, discoloured and ill-smelling waters. *Sphagnum* forms an important part of the vegetation-cover, while the depressions in the slightly uneven surface are occupied by tall stands of *Carex Lyngbyei* and *Eriophora*. Near the edge of the *Carex* bogs *Galium Brandegei* grows profusely. In meadows occupying former river-channels *Dupontia psilosantha*, *Arctophila fulva*, *Carex rariflora* and *Eriophorum russeolum* are the most important. In the Sphagnum we saw the tiny, sweet-scented *Hierochloë pauciflora*. On the higher ground grew *Betula glandulosa* var. *sibirica*, *Ledum decumbens*, *Vaccinium uliginosum*, *Rubus Chamaemorus* and *Empetrum nigrum*, the last two with ripe fruit.

In a shallow lake we managed to fish out a number of aquatic plants including *Sparganium hyperboreum*, *Potamogeton Richardsonii*, *P. vaginatus*, the last new to Alaska, and *Myriophyllum exalbescens*. In floating moss grew the beautiful, white-flowered and very fragrant *Ranunculus Pallasii* and also *Potentilla palustris*.

PASTOLIK, *July 16–24*

A week was spent attending the rounding up of a large reindeer herd on the tundra at Pastolik between the Yukon Delta and St. Michaels. Low, almost level tundra here extends inland for a distance of 10 or 15 miles, when a low range of volcanic hills is reached. Besides the very characteristic and well developed pattern of irregular polygonal frost ridges ("Strukturboden" or "rutmark") the chief feature of this climaxed tundra is the tussocks or "nigger-heads" which here attain a greater perfection than any I have seen anywhere else. The principal tussock-forming species here, as elsewhere in the region, is *Eriophorum vaginatum* and to a lesser extent also *Scirpus cespitosus* and *Carex lugens*.

Altogether but a dozen or so species dominate the flora and for mile after mile these same species are repeated. *Eriophorum vaginatum*, however, is the preeminent species and nowhere, except in the wettest places would it be possible to lay down a "Raunkiaer circle" without including it. Around the sides and base of the large tussocks formed by this species, some of which are many feet in diameter and attain a height of 4 feet, grow *Ledum decumbens*, *Rubus Chamaemorus*, *Betula glandulosa* var. *sibirica*, *Vaccinium Vitis-Idaea* and *V. uliginosum* var. *alpinum*, and *Spiraea Beauverdiana*, listed in decreasing order of frequency. Very often small, herbaceous species, such as *Thalictrum alpinum*, *Euphrasia mollis*, *Saxifraga Hirculus*, *Stellaria longipes*, *Polygonum Bistorta* and *P. viviparum*, find a congenial place on the peaty sides of such "nigger-heads."

In the bog-filled frost cleavages that occupy the interstices between the "polygon" ridges grow *Eriophorum russeolum* and *E. angustifolium* with a number of species of *Carex*.

The driest parts of the tundra are the "polygon" ridges themselves and the upper edge of the slumping banks of tundra lakes and ponds. Here we find *Empetrum*, *Rubus Chamaemorus*, *Pyrola grandiflora*, *Hedysarum alpinum*, *Rhodiola integrifolia*, *Arctagrostis latifolia*, *Arctostaphylos alpina* and, on the exposed soil facing the pond, *Senecio*

palustris, *Arctagrostis arundinacea* and *Polygonum alpinum* var. *lapathifolium*.

The low tundra perhaps everywhere is resting upon a more or less continuous sheet of solid ground-ice. Where frost action or other agencies have disturbed the protecting surface, "weathering" of the ground-ice immediately sets in and a pond or lake is eventually formed. Such ponds and lakes are always recognizable by the steep, slumping banks in which invariably exposures of solid ice may be seen.[1]

The vegetation of the tundra lakes and ponds show the same general paucity of species. *Sparganium hyperboreum*, *Potentilla palustris*, *Hippuris vulgaris* and *Ranunculus Pallasii* are the most common. *Utricularia vulgaris* var. *americana* also is common and on July 21 was in full bloom. Occasional, near the water's edge, are *Caltha natans*, *Epilobium palustre*, *Cicuta mackenziana*, new to Alaska, *Coeloplcurum Gmelini*, and, in the water, *Potamogeton filiformis* and its var. *borealis*, and *Callitriche verna*. Sedges are not very abundant although *Carex rostrata* and *C. aquatilis* are by no means rare. Schools of the interesting little Alaska blackfish, *Dallia pectoralis*, were seen in most of these ponds and lakes and are said to winter here, frozen in the mud on the bottom.

The coastal plain is practically level and in a creek near the foot of the hills, more than ten miles from the sea, we saw old drift wood. The hills rise abruptly to a rolling plateau with elevations between 1,000 and 1,500 feet above sea-level. On the steep escarpment facing the tundra grow dense almost impenetrable "islands" of irregular outline composed of low alder bushes. They are conspicuous at a distance by their dark green colour which contrasts sharply with the brownish green of the slope. Due to snow pressure in winter the branches are decumbent or ascending. They sometimes trail down the slope for ten feet or more before the ends of the branches turn upwards. These alder thickets do not cover the slope completely and the observer cannot fail to get the impression of an otherwise stable heath association being invaded by the alder. *Calamagrostis Langsdorffii*, *Equisetum arvense*, and *Cystopteris fragilis* are the only accessory species of importance in the alder thickets. Near the outside fringe, on the roots of the alder, grows *Boschniakia rossica*.

[1] See also: Porsild, A. E.: (1938) Earth Mounds in Unglaciated Arctic Northwestern America, Am. Geogr. Journ. **28**: 46–58.

On the slope, between the alder "islands," we found a luxuriant form of the usual browse-heath of which the chief components in order of importance, are *Betula glandulosa* var. *sibirica*, *Ledum decumbens*, *Vaccinium uliginosum* var. *alpinum*, *Spiraea Beauverdiana* and *Potentilla fruticosa*.

The Plateau

A more interesting and varied flora was found on the strongly weathered volcanic trap of the plateau. In the coarse gravel we saw *Woodsia glabella*, *Kobresia Bellardi*, *Tofieldia coccinea*, *Salix phlebophylla*, *Arenaria macrocarpa* and *A. arctica*, *Silene acaulis*, *Dianthus repens*, *Saxifraga flagellaris*, *Dryas octopetala*, *Bupleurum americanum*, the very rare *Ligusticum Macounii* and *Phlox sibirica*. On the sides of gentle slopes, where the snow remains late and thus provides abundance of mo'sture during early summer, we found herb-mats with *Trisetum sibiricum*, *Carex stylosa* and *C. Williamsii*, *Zygadenus elegans*, *Lloydia serotina*, *Polygonum Bistorta*, *Anemone narcissiflora*, *Aconitum delphinifolium*, *Saxifraga hieracifolia* and *S. spicata*, *Astragalus lincaris* which is new to Alaska, *Coeloplcurum Gmelini*, *Lagotis Stelleri*, *Arnica Louiseana* and *A. Lessingii*, *Senecio resedifolius* and *Saussurea subsinuata*. Grasses and sedges were both rather poorly represented and neither played an important part in the composition of the herb-mats.

Many of the north slopes of the gently rolling plateau were completely covered with thick carpets of cladonias in which grew an occasional tuft of *Hierochloë alpina* and *Luzula nivalis* var. *latifolia*. Most of the winter pasture of the reindeer herds of the Norton Sound region is found on such plateaus, from ten to thirty miles back from the coast.

St. Michaels, *July 25*

At St. Michaels is the only harbour for sea-going vessels near the mouth of the Yukon, and for this reason it early gained importance as the gateway to the interior. Of this once important Russian stronghold there now remained but one small watch-tower. During the heyday of gold mining in Alaska at the beginning of the century, ocean freighters here transferred their cargo to the river boats. Decline in mining and finally the opening of the Alaska railroad finished the town. On the beach now lie the rotting hulls of nearly

fifty river boats, some of more than 1,000 tons burden. One of the largest, built in 1901 at a cost of a million dollars, was said to have made but one trip from St. Michaels to Dawson and back but in this one trip had paid for itself.

Time did not permit very much botanizing at St. Michaels but at Qiqertariaq, farther up the bay, we were able to put in a few hours examining some low, volcanic hills in the vicinity of the Eskimo settlement. The flora was very similar to that seen on the hills back of Pastolik although we added a few species not seen at that place; these were *Salix fuscescens*, *S. Seemannii* and *S. cuneata*, *Anemone Drummondii*, *Smelowskia calycina* var. *integrifolia*, *Saxifraga reflexa*, *Eritrichium aretioides* and *Pedicularis verticillata*.

On low, rather wet meadows, between the hills and the lagoon, and on old, stable dunes a varied and interesting littoral flora was met. Deserving special mentioning here were *Poa eminens*, *Carex Gmelini*, *Atriplex Gmelini*, *Koenigia islandica*, *Montia lamprosperma*, *Arenaria peploides* var. *major*, *Sagina intermedia*, *Stellaria humifusa*, *Ranunculus Cymbalaria*, *Lathyrus japonicus*, *Ligusticum Hultenii*, *Primula sibirica*, *Lomatogonium rotatum*, *Mertensia maritima*, *Plantago juncoides*, *Galium Brandegei* and *Chrysanthemum arcticum*.

UNALAKLET, *July 29–30*

Several days were spent near the village of Unalaklet which is the principal reindeer center in Norton Sound. From here an excursion was made to the winter reindeer pasture on the low hills 15 to 20 miles back from the coast, near the edge of the coniferous forest. The ten miles to the foot of the first strong rapids on the Unalaklet river we travelled by motor boat. Eskimo kayaks were brought along for the return trip and the motor-boat returned at once.

Crossing several miles of low, uninteresting heath and moorland we reached the partly timbered hills that in a series of terraces rise to an elevation of about 2,000 feet. The lower slopes carry a fine stand of white spruce while the terraces are treeless. Much of the forest floor was covered with almost pure stands of *Cladonia sylvatica* in which grew the tall and handsome *Festuca altaica*. Near a brook we saw, for the first time since we left the interior, *Moneses uniflora* and *Anemone Richardsonii*.

Above 1,500 feet the vegetation became more arctic-alpine and at this altitude and above it, as usual, we found the most interesting

flora. In addition to most of the alpine species seen on the hills at Pastolik and Qiqertariaq, we here added an undescribed *Melandrium* and the rare, yellow-flowered Cordilleran *Draba densifolia*, also collected in the Alaska Range at Broad Pass.

On the return trip some small ponds in the lowland yielded, amongst other species, *Potamogeton gramineus* var. *graminifolius* and *P. tenuifolius*. On old dunes near the lagoon grew the sweet-scented *Salix alaxensis* and the handsome, but fetid, sunflower-like *Senecio Pseudo-Arnica*, also *Papaver Macounii*, with pale yellow flowers 4–5 cm. in diameter, and, in addition, most of the littoral species seen at Qiqertariaq.

NOME, *August 6–10*

A peculiar zonal distribution of plants is very noticeable at Nome and, indeed, in all places in the Bering Sea region where mountains or hills are found exceeding 1,000 feet in elevation. Below this elevation the lowland is uniformly covered by a wet, marshy tundra everywhere inhabited by practically the same assortment of species. The chief variation which manifests itself when one travels inland, away from the sea-shore, is the increasing ratio of fruticose species over herbaceous ones.

On the hills, on the other hand, above 1,000 feet, a very different and much more varied flora is encountered and it is from here that most of the rare and interesting plants come for which the region is famous, notably the species that are Asiatic or at least most closely related to Asiatic species.

The reason for this zonation may be a climatic one, because in arctic countries, at least during summer, the temperature optimum appears to be found not at sea-level, but at elevations between 1,000 and 1,500 feet, but there are other possible factors to be considered. One is that at least a number of these species are calciphiles and in the strongly weathered and well drained volcanic trap, rich in calcite, so common in the region, perhaps find more congenial soil-conditions than in the acid lowland tundra. Lastly, a large number of the species peculiar to the mountain flora of the region suggest, from their general distribution, that they are old species, with reduced ability to migrate or to compete with the more aggressive species of the lowland. In these unglaciated hills, high above the greatest pleistocene submergence, they may have found a refugium where they have since persisted.

From personal experience, in one or two instances supplemented by the observations of Mr. Charles Thornton of Nome, the writer has selected 88 species which, in the Bering Sea region, appear to be restricted to levels above 1,000 feet. By grouping these according to their general distribution it is found that, roughly speaking, three-fourths are Western-Cordilleran, Bering Sea endemics or essentially Asiatic species transgressing into western America, while but one-fourth are circumpolar, or American species distributed across the continent from the Atlantic to the Pacific coast.

CIRCUMPOLAR, OF ESSENTIALLY SO; 17 species: *Woodsia alpina, W. glabella* and *W. ilvensis, Cystopteris montana, Dryopteris fragrans* and *Dr. Phegopteris, Botrychium Lunaria, Lycopodium alpinum, Selaginella selaginoides, Kobresia Bellardi, Lesquerella arctica, Saxifraga flagellaris* and *S. oppositifolia, Loiseleuria procumbens, Myosotis alpestris, Veronica Wormskjoldii,* and *Erigeron unalaschkensis.*

ESSENTIALLY AMERICAN, KNOWN FROM THE ATLANTIC TO THE PACIFIC COAST; 3 species: *Carex Williamsii, Habenaria viridis* var. *interjecta* and *Alnus crispa.*

WESTERN AMERICAN OR CORDILLERAN; 16 species: *Carex podocarpa, Zygadenus elegans, Arenaria obtusiloba, Delphinium scopulorum, Anemone Drummondii, Pulsatilla multiceps, Draba densifolia, Boykinia Richardsonii, Saxifraga reflexa* and *S. radiata, Oxytropis pygmaea, Bupleurum americanum, Androsace Chamaejasme, Penstemon* (?) *procerus, Arnica Louiseana*[1] and *Antennaria philonipha.*

ENDEMICS OF THE BERING SEA REGION; 15 species: *Carex nesophila, Veratrum album* ssp. *oxysepalum, Melandrium macrospermum, Delphinium Menziesii, Ranunculus Chamissonis, Papaver Walpolei, Aphragmus Eschscholtzianus, Cardamine Blaisdellii, Draba exalata, Ligusticum Macounii, Rhododendron kamtchaticum* ssp. *glandulosum, Mertensia Eastwoodae, Antennaria alaskana, Artemisia senjavinensis* and *A. globularia.*

ASIATIC, TRANSGRESSING INTO WESTERN AMERICA; 37 species: *Selaginella sibirica, Trisetum sibiricum, Tofieldia nutans, Salix cuneata* and *S. phlebophylla, Arenaria arctica* and *A. macrocarpa, Cherleria dicranoides, Dianthus repens, Oxygraphis glacialis, Cardamine purpurea, Smelowskia calycina, Parrya nudicaulis, Saxifraga bronchialis* ssp. *Funstonii, S. Eschscholtzii* and *S. serpyllifolia, Potentilla biflora, P. elegans* and *P. uniflora, Geum glaciale* and *G. Rossii, Oxytropis Mertensiana, Viola biflora* and *V. epipsila, Diapensia obovata, Gentiana algida* and *G. glauca, Phlox sibirica, Polemonium acutiflorum, Eritrichium aretioides, Lagotis Stelleri, Campanula lasiocarpa, Antennaria monocephala, Artemisia arctica, Arnica Lessingii, Senecio resedifolius*[1] and *Saussurea subsinuata.*

[1] Also isolated in Gaspé and Newfoundland.

From Nome one excursion was made to Bluff, about fifty miles east of Nome and several to Dexter Creek and Anvil Hill in the vicinity of Nome. Dexter Creek is the largest of several creeks that have cut through the foothills back of Nome. The creek bottom has been extensively worked over by gold dredges and its natural vegetation is largely destroyed. The flora which is now invading this virgin soil very much resembles that which is peculiar to fresh moraines, near a moving glacier.

On the slopes facing the creek was found a rather dense heath in which *Vaccinium uliginosum* var. *alpinum* is the most important component. With it grew *Salix phlebophylla, S. Chamissonis, S. rotundifolia,* and an occasional clump of the spectacular, purple-flowered *Rhododendron kamtchaticum* var. *glandulosum.* In moist places in the heath we saw several clumps of the large-flowered *Gentiana algida.* In herb-mats and in willow and alder thickets along the course of a small brook we saw in addition *Cystopteris montana, Botrychium Lunaria, Lycopodium clavatum* and *L. alpinum, Selaginella selaginoides, Veratrum album* ssp. *oxysepalum, Habenaria viridis, Papaver microcarpum, Chrysosplenium Beringianum, Geum Rossii, Gentiana glauca* and *G. propinqua, Mertensia paniculata* and *Valeriana capitata.*

On the upper slopes and plateau of Anvil Hill, at an elevation of between 1,000 and 1,500 feet, we found the greatest variety of species, including a number that we had not seen before. Amongst these was a small undescribed *Papaver* with pale yellow or white flowers and perfectly glabrous, somewhat coriaceous leaves. There was also a new *Draba,* recently described as *Dr. exalata* E. Ekm. Further there were *Arenaria arctica* and *A. macrocarpa, Cherleria dicranoides, Parrya nudicaulis, Lesquerella arctica, Cardamine Blaisdellii, Smelowskia calycina* var. *integrifolia, Parnassia Kotzebuei, Boykinia Richardsonii, Geum glaciale* and *G. Rossii, Oxytropis Mertensiana,* known in America only from here, *Arctostaphylos alpina, Androsace Chamaejasme, Eritrichium aretioides, Myosotis alpestris* var. *asiatica, Senecio resedifolius, Artemisia senjavinensis* and *Antennaria monocephala.*

A mining dump, abandoned 24 years before, was found completely covered with *Stereocaulon Pascale,* with a few tufts of *Festuca brachyphylla.*

Diomede Islands, *August 14–20*

A week was spent on Little Diomede Island in Bering Strait, halfway between East Cape and Cape Prince of Wales. A list of the plants collected there has been published recently in a separate list (Porsild, l. c., 1938).

Port Clarence

A visit to this place was made on August 24 and a few brief hours were spent collecting plants in the vicinity of Teller Reindeer Station. In the botanical history of Alaska, in point of prominence, Port Clarence perhaps is rivalled only by Unalaska. It was here that Kjellman, botanist to the Swedish Vega Expedition, from August 22 to 26, 1879, made the collection of plants which formed the basis of his classic "Fanerogamer från Vest-Eskimåernas land."[1] In it two hundred and eighty-seven species of vascular plants were listed, a great many of them for the first time in Alaska.

Because of its excellent harbour, perhaps the only good one for large ships north of the Aleuts, the place has been visited from time to time by most expeditions passing through the Strait and numerous small collections have come from here. Next in importance to Kjellman's is that made in 1901 by F. A. Walpole. His excellent collection which includes a number of species not recorded by Kjellman has never been published upon. It is deposited in the U. S. National Herbarium. It was at Teller also that the Amundsen-Ellsworth Expedition landed in the dirigible "Norge" after its historic flight over the Pole.

In his field diary, under August 24, 1926, the writer made the following notation: "Season too far advanced, most species have gone to seed and the foliage is turning into autumn colours." The remark is interesting because Kjellman, in 1879, in his list of plants from Port Clarence annotates nearly all species collected by him between August 22 and 26 as being in full bloom, including even such early-flowering species as *Parrya nudicaulis*, *Empetrum nigrum*, *Saxifraga oppositifolia* and *S. nivalis*, *Rubus acaulis* and many species, such as *Aconitum delphinifolium*, *Rosa acicularis*, *Epilobium latifolium*, *E. angustifolium* (sterile), *Selinum cnidiifolium*, *Gentiana glauca* (sterile), *Campanula uniflora*, *Arnica alpina*, *Artemisia Tilesii* and a number of others, which Kjellman states were still in bud.

[1] Kjellman, F. R., in Vega-Expeditionens Vetenskapliga Iakttagelser 2: 25–60 (1883).

It is not possible of course from phenological observation of two single seasons to postulate a change in climate, but the observations at least show that the season of 1926 must have been at least a full month earlier than that of 1879.

North Coast of Seward Peninsula

Several places were visited on the north coast, but large collections were made only on the Buckland River at the head of Eschscholtz Bay, chiefly from a place 26 miles above the delta. On the north coast the gently sloping foreland is from five to twenty miles wide and is cut up by shallow erosion-valleys separated by low ridges which generally extend to the coast and terminate in a bluff or low headland. Between the headlands are shallow bays, often enclosing, behind low sandspits, large lagoons into which rivers empty. None of these is of any considerable size, although some are navigable for shallow-draught boats for 10 or 20 miles. The coastal slopes are covered by the usual *Eriophorum-Carex* "niggerhead" tundra.

Along the shore are extensive dunes and old raised beaches inhabited by *Elymus arenarius* var. *mollis*, *Poa eminens* and *P. arctica*, *Festuca rubra* var. *arenaria*, *Carex Gmelini*, *Arenaria peploides*, *Rhodiola integrifolia*, *Artemisia Tilesii*, *Aster sibiricus*, *Taraxacum lateritium* and others.

Back of the lagoons are vast meadow-covered flats that imperceptibly change into heath. Most common in the meadows are *Arctophila fulva*, *Dupontia psilosantha*, *Puccinellia paupercula* var. *alaskana* and *P. phryganodes*, *Carex aquatilis*, *C. glareosa*, *C. incurva* and *C. rariflora*, *Eriophorum Scheuchzeri*, *Juncus balticus*, *Koenigia islandica*, *Arenaria physodes*, *Stellaria humifusa*, *Cochl aria officinalis*, *Chrysanthemum arcticum* and *Senecio palustris*.

On the Buckland River, five or ten miles above its mouth, the *Eriophorum vaginatum* tundra imperceptibly changes into heath of the usual *Betula glandulosa-Arctostaphylos alpina-Ledum-Vaccinium* composition, with a sprinkling of a few accessory herbaceous species, notably *Stellaria longipes*, *Rubus Chamaemorus*, *Senecio frigidus*, *Saussurea angustifolia* and *Pedicularis labradorica*.

Buckland River, *Sept. 7–10*

Buckland River is a fair sized stream, navigable for river boats to 26 miles above its mouth. We obtained temporary quarters at the

eskimo village Nunatsiaq at the foot of the rapids in the center of the winter range of the Eschscholtz Bay reindeer herds. The broad valley here is fringed by low volcanic hills of which a single knoll, Clem Mountain west of the village, attains an elevation of 1,800 feet. The floor of the valley is low and swampy, with numerous large and small lakes through which the river meanders. Small groves of spruce are found on the upper river but in the vicinity of Nunatsiaq the banks, lakes and streams are treeless but support dense thickets of willow and alder, with a dense undergrowth of *Equisetum arvense*, *Arctagrostis arundinacea* and *Calamagrostis Langsdorffii*. The alders which here grow 20–25 feet high supply practically all the firewood used at the village.

Although the season was far advanced a number of interesting records were added from here. *Zannichellia palustris*, collected in a lagoon near the delta, was new to Alaska. In wet marshes we got, in addition to some of the marsh species common to the region, *Carex tenuiflora*, *C. chordorrhiza* and *Eleocharis acicularis*, all new to Alaska, and, in addition, *Carex vaginata*, *C. Williamsii* and *C. paupercula*, *Luzula Wahlenbergii*, *Stellaria crassifolia*, *Subularia aquatica*, *Sanguisorba officinalis*, *Cicuta mackenzieana* and *Drosera rotundifolia*. Common here, as elsewhere in the district on slumping river and lake banks, were the curious 4-valved *Rorippa barbareaefolia* and *Polygonum alpinum* var. *lapathifolium*.

By the middle of September severe frosts put a stop to further botanizing on land but we found that for some time yet aquatic plants could be collected, through holes cut in the ice, with greater ease than in summer and without being tormented by mosquitoes. Our large collections of aquatics extended the range of nearly all species collected earlier in the summer, including that of the new pondweed *Potamogeton Porsildiorum*. Further additions to the flora of Alaska were *Callitriche autumnalis*, *Myriophyllum alterniflorum* and *Utricularia intermedia*.

By December we had completed the cataloguing and packing of the summer's collections. These were shipped to the railhead at Fairbanks via the dogtrail while we ourselves started on our long sledge journey along to Arctic coast of Alaska for new and "greener pastures" in Arctic Northwest Canada.

INDEX TO MAJOR COLLECTIONS CITED (see map on p. 145)

No. on map	Serial Number	Place and location	Date
		FAIRBANKS DISTRICT	
1.	Nos. 106–154	Goldstream Creek and Pedro Dome, 51 miles north of Fairbanks. Elevation 800–2000 ft. above sea-level, 65° N.–147° 30′ W.	June 18, 1926
2.	Nos. 155–211	Muskeg 10 miles east of Fairbanks, 64° 45′ N.–147° 30′ W.	June 14, 1926
3.	Nos. 212–243	Near College, 7 miles west of Fairbanks, 64° 52′ N.–147° 50′ W.	June 17, 1926
4.	Nos. 593–603	Lake 10 miles west of Fairbanks, 64° 52′ N.–148° W.	June 29, 1926
5.	Nos. 376–378	Taylor's Fox Ranch, Richardson Highway, 56 miles east of Fairbanks.	June 26, 1926
		ALASKA RANGE	
6.	Nos. 1–105	Broad Pass, elevation between 2140 and 3000 ft. 63° 26′ N.–149° W.	June 8–11, 1926
7.	Nos. 244–273	Mountains between Healy and Moody Creeks, 63° 50′ N.–148° 40′ W. Elevation 2000–4000 ft. above sea-level.	June 19, 1926
8.	Nos. 317–375	Healy on west side of Nenana Valley, 63° 50′ N.–149° W. Elevation 1000–2000 ft. above sea-level	June 18, 1926
9.	Nos. 274–316	Nenana Valley near Lignite, 63° 55′ N.–149° W.	June 21, 1926
10.	Nos. 379–452	Richardson Highway between Summit and McCarty, 63° 10′ to 64° 10′ N.–145° 40′ W. Elevation 1000–3000 ft. above sea-level.	June 28, 1926
11.	Nos. 453–515	Richardson Highway, Castner Glacier, 63° 25′ N.–145° 40′ W. Elevation 2000–4000 ft. above sea-level.	June 27, 1926
12.	Nos. 516–571	Richardson Highway between Paxon and Summit, 63° to 63° 20′ N.–145° 30′ W. Elevation 2000–3000 ft. above sea-level.	June 26, 1926
13.	Nos. 572–592	Richardson Highway, near Paxon, south of divide, 63° N.–143° 30′ W. Elevation 2000–3000 ft. above sea-level.	June 27, 1926

No. on map	Serial Number	Place and location	Date
		CHITINA RIVER DISTRICT[1]	
14.	Nos.	Head of Chitina River, 61° N.–141° 40′ W. Elevations chiefly between 2000 and 4000.	1925
		LOWER TANANA AND MIDDLE YUKON RIVER	
15.	Nos. 631–657	Tanana River, Hot Springs, 64° N.–150° 20′ W.	June 8, 1926
16.	Nos. 604–613	Yukon River, Birches, 65° 06′ N.–153° 30′ W.	July 3, 1926
17.	Nos. 614–630	Yukon River, Kokrines, 64° 55′ N.–150° 40′ W.	July 8, 1926
		KOKRINES MOUNTAINS	
18.	Nos. 658–684	Kokrines Mountains, near sulphur springs, 65° 17′ N.–154° 30′ W. Elevation 800 ft. above Yukon River.	July 6, 1926
19.	Nos. 685–815	Kokrines Mountains, divide towards Melozitna River, 65° 20′ N.–154° 30′ W. Elevation between 800–4000 ft. above sea-level.	June 23 to July 5, 1926
		LOWER YUKON AND DELTA	
20.	Nos. 816–833	Holy Cross Mission, 62° 13′ N.–159° 45′ W.	July 5, 1926
21.	Nos. 834–841	Just above delta, abt. 62° N.–163° 30′ W.	July 13, 1926
22.	Nos. 842–845A	Marshall Wireless Station, 61° 55′ N.–162° 05′ W.	July 8, 1926
23.	Nos. 846–887	Kotlik in the delta, 63° 3′ N.–163° 35′ W.	July 10–14, 1926
		NORTON SOUND REGION	
24.	Nos. 888–937	Volcanic hills back of Pastolik, 63° 8′ N.–163° W. Elevation 1000 ft. above sea-level.	July 21, 1926
25.	Nos. 938–1026	Pastolik, low tundra at sea-level, 63° 22′ N.–163° W.	July 16–20,[2] 1926
26.	Nos. 1027–1030	St. Michaels, 63° 30′ N.–162° W.	July 25, 1926
27.	Nos. 1031–1067	Low volcanic hills back of Qiqertariaq, 63° 35′ N–161° W.	July 27, 1926
28.	Nos. 1068–1098	Qiqertariaq, low meadows and sea-shore, 63° 35′ N.–161° W.	July 27, 1926
29.	Nos. 1099–1120	Unalaklet, low meadows and sea-shore, 63° 52′ N.–160° 45′ W.	July 29–30, 1926

[1] Collection by H. M. Laing.

[2] Due to a misprint part of this collection was distributed erroneously dated July 16–29, 1926.

No. on map	Serial Number	Place and location	Date
		LOWER YUKON AND DELTA—*Continued*	
30.	Nos. 1121–1170	Low hills 10–15 miles back of Unalaklet. Elevation 1000–2000 ft. above sea-level.	July 29, 1926
		SEWARD PENINSULA	
31.	Nos. 1171–1173	Golofnin, 64° 30′ N.–163° W.	August 1, 1926
32.	Nos. 1174–1299	South coast near Bluff, 64° 33′ N.–163° 45′ W. Elevation 0–1500 ft. above sea-level.	Aug. 5–6, 1926
33.	Nos. 1300–1408	Nome, Anvil Hill and Dexter Creek, about 64° 30′ N.–165° 20′ W. Elevation 0–1500 ft. above sea-level.	Aug. 6–10, 1926
34.	Nos. 1409–1452	Port Clarence, near Teller, 65° 16′ N.–166° 20′ W., sea-shore and low tundra.	Aug. 24, 1926
35.	Nos. 1453–1486	North coast, Kiwalik, 65° 50′ N.–162° W.	Aug. 26, 1926
36.	Nos. 1487–1634	North coast, Buckland River, 26 miles above the delta, near Nunatsiaq village, 66° N.–161° 4′ W.	Sept. 7–10, 1926
		LITTLE DIOMEDE ISLAND	
37.	Nos. 1640–1730	Little Diomede Island, 65° 46′ N.–168° 55′ W.	Aug. 14–20, 1926

In the catalogue the undermentioned symbols indicate the herbarium in which the specimen cited was seen. Where no symbol is appended the specimen is in the Herbarium of the National Museum of Canada. Where no collector's name is given the collection is that of the writer and his brother.

C—Herbarium of the University of Copenhagen.
Can—Herbarium of the National Museum of Canada, Ottawa.
G—Gray Herbarium, Harvard University, Cambridge, Mass.
NY—Herbarium of the New York Botanical Garden, New York.
T—private herbarium of Mr. Charles Thornton, Nome, Alaska.
US—United States National Herbarium, Washington, D. C.

The families and the genera are arranged essentially according to Dalla Torre et Harms, Genera Siphonogamarum (1907). Within the genera the species, for the sake of convenience, are arranged alphabetically, except in the genus *Carex* where the arrangement followed is that of Mackenzie in N. Am. Fl. 18 (1935).

Annotated Catalogue of Vascular Plants

Woodsia alpina (Bolton) S. F. Gray;[1] *W. hyperborea* R. Br. (probably not *W. alpina* of Gray's Man. Ed. 7, 44).—Norton Sound: volcanic hills back of Pastolik, No. 889; low hills back of Unalaklet, No. 1121. On moist cliffs.

W. glabella R. Br.—Alaska Range: Richardson Highw. between Summit and McCarty, No. 380. Norton Sd.: low hills back of Unalaklet, No. 1122. Seward Pen.: south coast near Bluff, No. 1175; Nome, moist cliffs, No. 1303; Anvil Hill, dry gravel, No. 1302. Rare or occasional in gravelly places in the mountains throughout the region.

W. ilvensis (L.) R. Br.—Alaska Range: Broad Pass, No. 1. Kokrines Mts.: divide towards Melozitna R. No. 685. Norton Sd.: low, volcanic hills at Qiqertariaq, No. 1031.

Cystopteris fragilis (L.) Bernh.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 106. Alaska Range: Mts. between Healy and Moody Cr., No. 244; Nenana Valley, Lignite, No. 274; Richardson Highw. between Summit and McCarty, No. 379; Head of Chitina R., *H. M. Laing*, Nos. 1 & 2. Norton Sd.: volcanic hills back of Pastolik, No. 888; low, volcanic hills, Qiqertariaq, No. 1032. Seward Pen.: south coast, Bluff, No. 1174; Nome, Anvil Hill, No. 1301. Common in moist, shaded places throughout the region.

C. montana (Lam.) Bernh.—Alaska Range: Nenana Valley, Healy, No. 317: Richardson Highw., Castner Glacier, No. 453. Seward Pen.: Nome, Anvil Hill, No. 1300.

Dryopteris austriaca (Jacq.) Woynar; *Dr. dilatata* (Hoffm.) A. Gray.—Alaska Range: Nenana Valley, Healy, No. 318; Richardson Highw., Castner Glacier, No. 455. Lower Yukon: Marshall, No. 842. Norton Sd.: low, volcanic hills at Qiqertariaq, No. 1033. Occasional in open woods and thickets, north to Kotzebue Sd.

Dr. fragrans (L.) Schott.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 107. Kokrines Mts.: divide towards Melozitna R., No. 686. Norton Sd.: hills back of Unalaklet, No. 1123. Seward Pen.: north coast, Buckland R., No. 1487. Probably common in alpine places throughout the region.

Dr. Linnaeana C. Chr.—Alaska Range: Richardson Highw., Castner Glacier, No. 456. Tanana R.: Hot Springs, No. 631; Holy Cross, No. 816.

Previously known from S. and S. W. Alaska only.

Dr. Phegopteris (L.) C. Chr.—Alaska Range: Richardson Highw., Castner Glacier, No. 454. Tanana R.: Hot Springs, No. 632. Seward Pen.: Nome (*Eastwood*).

New to Central Alaska.

[1] The Alaska material of Polypodiaceae was kindly checked by Dr. Carl Christensen, Copenhagen.

Dr. Robertiana (Hoffm.) C. Chr.—Not seen by us, but collected on Yukon R.: between Tanana and Ramparts, *L. J. Palmer*, No. 39 (Can).

Also known from Dawson, Yukon Ter., *M. O. Malte*, No. 72 (Can.).

Botrychium Lunaria (L.) Swartz.—Alaska Range: Nenana Valley, Healy, No. 319; Richardson Highw., between Summit and McCarty, No. 381. Kokrines Mts.: divide towards Melozitna R., No. 688. Seward Pen.: Nome, Anvil Hill, No. 1303-A.

Previously recorded from S. and S. W. Alaska only.

B. Lunaria (L.) Swartz var. minganense (Vict.) Dole in Fl. of Vermont, ed. 3: 1 (1937). *B. minganense* Vict. in Contr. Lab. Bot. Univ. Montreal, **11**: 331 (1927).—Kokrines Mts.: divide towards Melozitna R., No. 687.

In the large series are many intermediate forms between the variety and the head species. New to the flora of Alaska.

Equisetum arvense L.—Alaska Range: Nenana Valley, Lignite, No. 275. Head of Chitina R.: *H. M. Laing*, No. 3. Seward Pen.: south coast, Bluff, No. 1176-A; Nome, *Thornton*, No. 90 (T); north coast, Buckland R., No. 1488. Common throughout the region.

E. limosum L.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 113; muskeg east of town, No. 158. Alaska Range: Richardson Highw., Summit (field notes). Norton Sd.: low hills back of Unalaklet, No. 1124. Seward Pen.: north coast, Buckland R., No. 1489.

Previously recorded from S. and S. W. Alaska only.

E. palustre L.—Fairbanks: muskeg east of town, No. 156-A. Yukon R.: Kokrines, No. 614. Seward Pen.: south coast, Bluff, No. 1177.

Previously recorded only from S. E. Alaska.

E. pratense Ehrh.—Head of Chitina R.: above timber line, 4000 feet elevation, *H. M. Laing*, No. 4. Yukon River: Birches, No. 604. Seward Pen.: Nome, *Thornton*, No. 357 (T).

Previously known only from Seward Pen. (*Eastwood*).

E. scirpoides Michx.—Alaska Range: Broad Pass, No. 5. Fairbanks: in a muskeg, No. 157; College, No. 212. Alaska Range: Nenana Valley, Lignite, No. 276; Healy, No. 320. Head of Chitina R.: *H. M. Laing*, Nos. 5 and 6. Norton Sd.: Pastolik, No. 938. Seward Pen.: south coast, Bluff, No. 1176; Port Clarence, No. 1409. Common throughout the region, north to Kotzebue Sd.

E. sylvaticum L. var. squarrosum A. A. Eat. in Fern Bull. **9**: 36 (1901).—Fairbanks: Goldstream Cr. and Pedro Dome, No. 112. Seward Pen.: *Thornton* (no number) (T).

Fernald in Rhodora, **20**: 129 (1918), has pointed out that the var.

squarrosum, characterized by rough branches, is the plant of Eurasia, whereas all material from North America, excepting some specimens from Alaska and Yukon, belong to var. *pauciramosum* Milde. The type of var. *squarrosum* came from SEWARD PEN.: Nome, *Flett*, No. 1524 (G).

E. VARIEGATUM Schleich.—FAIRBANKS: in a muskeg, No. 156. HEAD OF CHITINA R.: *H. M. Laing*, No. 7. KOKRINES MTS.: divide towards Melozitna R., No. 689; near hot sulphur springs, No. 658. SEWARD PEN.: south coast, Bluff, No. 1177-A. Common throughout the region.

LYCOPODIUM ALPINUM L.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 109-A. ALASKA RANGE: Richardson Highw., Castner Glacier, No. 458. NORTON SD.: hills back of Unalaklet, No. 1127. SEWARD PEN.: Nome, Anvil Hill, No. 1306; north coast, Buckland R., No. 1490. Rare or occasional in alpine places throughout the region.

L. ANNOTINUM L.—ALASKA RANGE: Nenana Valley, Healy, No. 321. KOKRINES MTS.: divide towards Melozitna R., No. 691. SEWARD PEN.: Nome, *Thornton*, No. 364 (T); north coast, Buckland R., No. 1492. Probably common throughout the region.

All the material except the first number belongs to var. PUNGENS (La Pylaie) Desv.

L. CLAVATUM L. var. MONOSTACHYON Grev. & Hook.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 110; College, No. 213. ALASKA RANGE: Broad Pass, No. 2. KOKRINES MTS.: divide towards Melozitna R., No. 694. NORTON SD.: hills back of Unalaklet, No. 1125. Occasional in open, dry spruce woods.

L. COMPLANATUM L.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 109; College, No. 214. ALASKA RANGE: Broad Pass, No. 4. KOKRINES MTS.: divide towards Melozitna R., No. 692. NORTON SD.: hills back of Unalaklet, No. 1126.

The above material has been referred by Victorin (in herb.) to var. CANADENSIS Vict. in Contr. Lab. Bot. Univ. Montr. No. **3**: 70 (1925).

L. OBSCURUM L. var. DENDROIDEUM (Michx.) D. C. Eaton (see Fernald in RHODORA **19**: 188 (1921))—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 108. KOKRINES MTS.: divide towards Melozitna R., No. 693.

Not previously recorded from the mainland of Alaska north of Sitka; known also from Attu, westernmost island of the Aleutian chain (Hultén, Fl. Aleut. Isl. 60 (1937)).

L. SELAGO L.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 111. ALASKA RANGE: Broad Pass, No. 3; Richardson Highw., Castner Glacier, No. 459. NORTON SD.: Pastolik, No. 939; hills back of Unalaklet, No. 1128. SEWARD PEN.: north coast, Buckland R., No.

1491. Diomede Isl.: No. 1640. Rare or occasional in mountains of the interior, common in the Bering Sea region.

Selaginella selaginoides (L.) Link.—Alaska Range: Nenana Valley, Lignite, No. 277. Seward Pen.: Nome, No. 1304.

From Alaska not previously recorded from north of the Aleutian chain or Kenai Pen. (Hultén, Fl. Aleut. 62 (1937).)

S. sibirica (Milde) Hieron. in Hedwigia **39**: 290 (1900). *S. Schmidtii* Trelease in Harriman Alaska Exp. **5**: 394. (1905).—Richardson Highw.: near Munson, No. 159. Alaska Range: Nenana Valley, Healy, No. 322. Kokrines Mts.: divide towards Melozitna R., No. 690. Seward Pen.: Nome, Anvil Hill, No. 1305.

According to Hultén, Fl. Aleut. 62 (1937), the proper name for the plant of Alaska, which has generally passed as *S. rupestris* Rupr., is *S. sibirica*. Our material is a good match also of *S. Standleyi* Maxon in Smithson. Misc. Publ. **5**: 72 (1920). Rare or occasional in dry, gravelly places.

[Pinus pumila Regel.—The puzzling record in literature of "*Pinus Cembra*" from Kotzebue Sd. is due to Ledebour, who (Fl. Ross. **3**: 674) in error cites Hooker & Arnott (Beechey's Voy.) as having recorded the pine from Kotzebue Sd. As a matter of fact these authors mention no conifers from that place and record *Pinus Cembra* only from Kamtchatka. The error is perpetuated by later authors, *e. g.* Rothrock, Turner, and last by Gelert in Ostenfeld, Fl. Arctica **1**: 15 (1902). *Pinus pumila* may safely be excluded from the flora of Alaska.]

Larix laricina (DuRoi) Koch. *L. alaskensis* Wight in Smiths. Misc. Coll. **1**: 174, tab. 17 (1907), fide Ostenfeld & Larsen, Kgl. Dansk Vidensk. Selsk. Biol. Medd. **9**, 2: 86 (1930).

The larch, in field notes, was recorded as common in the Alaska Range and in the Fairbanks region. According to Ostenfeld & Larsen l. c. (map viii), distributed throughout the interior of Alaska, from the upper Yukon R. to the lower Kuskokwim R.

Picea glauca Voss. *P. canadensis* sensu B. S. P., not Link.—Head of Chitina R.: *H. M. Laing*, No. 8. Kotzebue Sd.: Napaktolik R., No. 6199.

The white spruce, in field notes, was recorded as common in all parts of the interior visited by the author. In the Alaska Range the tree limit was generally found between 2000 and 3000 feet. On the lower Yukon the white spruce is absent below Marshall. In the Norton Sd. region it reappears some distance back from the coast but at Elim, on the north shore of Norton Bay, fair sized spruce reach the coast. In Seward Peninsula, Buckland River is well timbered fifty miles above its delta. Splendid stands of white spruce were also seen

on Koyuk R., and on some of its eastern tributaries. Some trees on Quartz Cr. near the divide measured 75 feet in height and produced fine building logs 24 feet long. All the larger rivers discharging into Kotzebue Sd. are timbered, the Noataq north at least to 68° N.

P. MARIANA (Mill.) B. S. P.

The black spruce, in field notes, was recorded as common in the Alaska Range and on the upper Yukon. No black spruce was seen on Norton Sd., Seward Peninsula, or on the rivers draining into Kotzebue Sd.

JUNIPERUS COMMUNIS L.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 515; between Paxon and Summit, No. 516. HEAD OF CHITINA R.: *H. M. Laing*, No. 9. The material all belongs to the var. MONTANA Ait.

New to the flora of central Alaska.

J. HORIZONTALIS Moench.—HEAD OF CHITINA R.: elevation 2000 to 2500 feet, *H. M. Laing*, Nos. 10 and 11.

This species does not appear to have been recorded previously from Alaska.

SPARGANIUM HYPERBOREUM Laest.—ALASKA RANGE: Broad Pass, No. 8 (last year's fruiting plant). KOKRINES MTS.: divide towards Melozitna R., No. 695. YUKON DELTA: Kotlik, No. 848. NORTON SD.: Unalaklet, No. 1100; hills back of Unalaklet, No. 1129. SEWARD PEN.: Nome, Nos. 1307 and 1308; *Thornton*, No. 449 (T); north coast, Kiwalik R., No. 1454; Buckland R., Nos. 1493 and 1495. Probably common in the lowland throughout the region.

S. MINIMUM Fries.—FAIRBANKS: No. 593. ALASKA RANGE: Broad Pass, *L. J. Palmer*, No. 1877 (US). YUKON R.: Holy Cross, No. 820.

S. MULTIPEDUNCULATUM (Morong) Rydb. *S. simplex* Am. authors, not Huds. See Fernald in RHODORA **27:** 190 (1925) and **33:** 24 (1931). —YUKON RIVER: Holy Cross, Nos. 818 and 819. YUKON DELTA: Kotlik, No. 849. NORTON SD.: Pastolik, Nos. 944 and 945. SEWARD PEN.: north coast, Buckland R., No. 1494.

New to the flora of Alaska.

POTAMOGETON FILIFORMIS Pers.[1]—NORTON SD.: Pastolik, No. 940; Unalaklet, No. 1101. SEWARD PEN.: Port Clarence, No. 1410-A. Common in lakes of the Bering Sea region, north to Kotzebue Sd.

P. FILIFORMIS Pers. var. BOREALIS (Raf.) St. John.—ALASKA RANGE: Nenana Valley, Lignite, No. 278. NORTON SD.: Pastolik, No. 941; Unalaklet, No. 1099.

[1] Professor M. L. Fernald kindly examined and identified *Potamogeton* in the collection. Our material of *P. Porsildiorum* and *P. pusillus* is included in the distribution given for those species in his monograph of the linear-leaved species of *Potamogeton* in Mem. Am. Acad. **17,** 1 (1932).

P. GRAMINEUS L. var. GRAMINIFOLIUS Fries. *P. heterophyllus* of most Am. auth.—FAIRBANKS: *L. J. Palmer*, No. 1866 (US). NORTON SD.: Unalaklet, No. 1131. SEWARD PEN.: north coast, Buckland R., No. 1497. SELAVIK L.: *L. J. Palmer*, 1923 (U.S.).

P. PERFOLIATUS L. var. GRACILIS Fries.—FAIRBANKS: *L. J. Palmer*, No. 1862. YUKON R.: Holy Cross, No. 817. SEWARD PEN.: north coast, Buckland R., No. 1499. Perhaps the most common member of the genus within the parts of Alaska visited.

P. PORSILDIORUM Fernald in Mem. Am. Acad. **17**, 1: 40; Pl. 2, figs. d & e; Pl. 28, fig. 4; Pl. 32, fig. 2 and Pl. 39, fig. 5; map 3 (1932).—FAIRBANKS: Goldstream Cr. and Pedro Dome, June 12, 1926 (no number). SEWARD PEN.: north coast, Buckland R., No. 1498.

This rare plant, the type of which came from the Mackenzie Delta, N.W.T., is known in addition from one station in the Hudson Bay region. According to Fernald l. c. *P. Porsildiorum* is closely related to the Siberian *P. subsibiricus* Hagstr.

P. PUSILLUS L.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 116. The var. TENUISSIMUS M. & K. was found in the same place, No. 115.

P. RICHARDSONII (Benn.) Rydb.—RAT R. ON THE PORCUPINE R.: above Ft. Yukon, *R. Kennicott* (NY). YUKON DELTA: Kotlik, No. 847. NORTON SD.: Pastolik, No. 943; Unalaklet, No. 1102.

P. TENUIFOLIUS Raf. *P. microstachys* Wolfg. See Fernald in RHODORA **33**: 209 (1931).—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 114. RAT R. ON THE PORCUPINE R.: above Ft. Yukon, *R. Kennicott* (US). NORTON SD.: Pastolik, No. 942; Unalaklet, No. 1130. SEWARD PEN.: north coast, Buckland R., No. 1496.

P. VAGINATUS Turcz. *P. moniliformis* St. John.—YUKON DELTA: Kotlik, No. 846.

This species does not appear to have been recorded previously from Alaska, although one sheet from the ALEUTIAN ISL.: Atka, Eyerdam, No. 1290 (Can.), distributed as *P. filiformis* Pers. var. *borealis* (Raf.) St. John, seems to belong here.

ZANNICHELLIA PALUSTRIS L. See Porsild in RHODORA **34**: 94 (1932).—SEWARD PEN.: north coast, Buckland R., No. 1499.

ZOSTERA MARINA L.—NORTON SD.: Golofnin Bay, No. 1171. SEWARD PENINSULA: Port Clarence, No. 1410. See Porsild, RHODORA **34**: 90 (1932).

RUPPIA SPIRALIS L.

There is in the National Herbarium of Canada a sheet marked "Alaska, Pt. Etcher, Lat. 60°, June 18, 1892, *J. M. Macoun*, No. 28-133." The writer has not been able to find that locality on any of the Alaska maps he has examined. Hultén, Fl. Aleut. 67 (1937), for the

first time records the species from Alaska, Amlia Is. and the Pribilof Islands. Macoun's unpublished record thus extends the range of *Ruppia* still farther north.

TRIGLOCHIN PALUSTRIS L.—FAIRBANKS: in a muskeg, No. 183, *L. J. Palmer*, No. 1779 (US). ALASKA RANGE: Nenana Valley, Lignite, Healy and Moody Cr., No. 289; Richardson Highw., between Summit and McCarty, No. 410. NORTON SD.: Qiqertariaq, No. 1077; St. Michaels, *W. E. Nelson*, (US). SEWARD PEN.: Nome, Dexter Cr., No. 1306; south coast, Bluff, No. 1205.

Previously recorded from S. E. Alaska only.

HIEROCHLOË ALPINA (Sw.) Roem. & Schult.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 118. ALASKA RANGE: Broad Pass, No. 9; Richardson Highw., Castner Glacier, No. 466. NORTON SD.: hills back of Pastolik, Nos. 890 and 891 (the last is a viviparous form); Pastolik, No. 958; Qiqertariaq, No. 1037. SEWARD PEN.: Port Clarence, No. 1412; north coast, Buckland R., No. 1510. DIOMEDE ISL.: No. 1645 (luxuriant form). Common throughout the region.

H. ODORATA (L.) Wahlenb.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, No. 517.

H. PAUCIFLORA R. Br.—YUKON DELTA: Kotlik, No. 850. SEWARD PEN.: north coast, Buckland R., No. 1511. DIOMEDE ISL.: No. 1646. Common in Sphagnum bogs in low tundra of the Bering Sea region.

PHLEUM ALPINUM L.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 465.

There does not appear to be any previous record of this plant from the interior of Alaska.

PH. PRATENSE L.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 383 (becoming established). YUKON R.: Kokrines, No. 616 (naturalized on riverbanks).

ALOPECURUS AEQUALIS Sobol. var. NATANS (Wahlenb.) Fernald in RHODORA **27**: 196 (1925).—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 384. YUKON R.: Holy Cross, No. 821.

The var. *natans* seems well distinguished from the typical form of the species by the almost total absence of an awn. Previously known from S. E. Alaska only.

A. ALPINUS Sm. *A. Stejnegeri* Vasey in Proc. U. S. Nat. Mus. **10**: 153 (1887); *A. beringianus* Gdgr. in Bull. Soc. Bot. France, **66**: 298 (1920); *A. alpinus* Sm. var. *Stejnegeri* (Vasey) Hultén, Fl. Aleut. 70 (1937).—YUKON DELTA: Kotlik, No. 851. NORTON SD.: Pastolik, Nos. 946, 947 and 948.

The above numbers, all except No. 947, belong to the curious looking form (f. **Stejnegeri**, n. comb.) originally described from the

Commander Islands. Forma *Stejnegeri*, notwithstanding its rather striking appearance, is considered merely an edaphic form caused by excess nitrogen and a moist climate. It is known chiefly from bird- and seal-rookeries of the Bering Sea region but wherever found typical plants as well as intermediate forms are common.

A. OCCIDENTALIS Scribn. & Tweedy in Bot. Gaz. **11**: 170 (1886).—NORTON SD.: hills back of Unalaklet, No. 1136. SEWARD PEN.: Nome, *A. S. Hitchcock*, No. 333 (G) as *A. alpinus*.

According to Hultén, Fl. Kamtch. **1**: 92 (1927), *A. occidentalis* may prove the same as *A. glaucus* Less. Although by some writers reduced to synonymy (Hitchcock, Man. 787 (1935)), *A. occidentalis* differs strikingly from *A. alpinus* by its long, slender, creeping rhizomes and by its tall, slender and conspicuously glaucous culms that are leafy to the top. In our specimens the culms are 60 to 70 cm. tall and the leaves very scabrous; the flowering spikes are 16 mm. long and the awns shorter than those shown by Hultén, l. c. fig. 8. *A. occidentalis*, in America, was previously known only from Alberta, Utah and Colorado.

The following five sheets in the Nat. Herb. of Canada, all under *A. alpinus*, belong here. ALBERTA: Elbow R., *Macoun*, No. 18,626; Milk R., *Macoun*, No. 13,010; Old Man R., *Dawson*, No. 30,178; Crow's Nest Forest Reserve, *Cram*, No. 102,788. YUKON TERRITORY: Ranch Cr., *Gorman*, No. 1004.

PHIPPSIA ALGIDA (Soland.) R. Br.—NORTON SD.: Pastolik, No. 949. DIOMEDE ISL.: Nos. 1642 and 1643 (the last is a luxuriant form).

Previously known from Kotzebue Sd. and the north coast.

ARCTAGROSTIS ARUNDINACEA (Trin.) Beal, Grasses of N. Am. **2**: 317 (1896). *A. macrophylla* Nash in Bull. N. Y. Bot. Gard. **2**: 151, (1901).—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 460. KOKRINES MTS.: divide towards Melozitna R., No. 700. YUKON DELTA: Kotlik, No. 855. NORTON SD.: Pastolik, No. 951. SEWARD PEN.: south coast, Bluff, No. 1182; Nome, *Thornton*, 87 (T); Port Clarence, No. 1415; north coast, Buckland R., No. 1513.

The writer has seen a sheet in U. S. Nat. Herb. said to be part of the TYPE in Trinius' herbarium, with a copy of the original label, reading: "*Vilfa arundinacea* m [ihi]. Archipelago Kotzebue—*Fischer*." The 5 or 6 branchlets on the sheet well match Trinius' Spec. Gram. Icon. & Desc. **1**, icon. 55 (1828). The type of *A. macrophylla* Nash came from Dawson, Yukon Territory, *R. S. Williams*, July 14, 1899 (NY). It differs in no way from *A. arundinacea*. Common throughout the region, especially on alluvial soil.

A. LATIFOLIA (R.Br.) Griseb.—ALASKA RANGE: Broad Pass (field notes). SEWARD PEN.: Nome, No. 1312. DIOMEDE ISL.: No. 1650. Common on the Bering Sea coast to north of Seward Pen., and in alpine meadows of the interior.

AGROSTIS BOREALIS Hartm.—NORTON SD.: hills back of Qiqertariaq, No. 1035. SEWARD PEN.: north coast, Buckland R., No. 1512. The material belongs to var. TYPICA Fern. in RHODORA, **35**: 203–207 (1933).

A. SCABRA Willd. *A. hyemalis* of many authors, not (Walt.) B. S. P. See Fernald in RHODORA, **35**: 207–212 (1933).—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 393. TANANA R.: Hot Springs, No. 635. KOKRINES MTS.: divide towards Melozitna R., No. 705.

CALAMAGROSTIS CANADENSIS (Michx.) Nutt. var. LANGSDORFFII (Link) Inman.—KOKRINES MTS.: divide towards Melozitna R., No. 698. NORTON SD.: hills back of Pastolik, No. 894; Pastolik, No. 955. SEWARD PEN.: north coast, Kiwalik, No. 1457; Buckland R., Nos. 1501, 1504, 1505, 1507 and 1508. Common throughout the region and perhaps the most common grass of the interior.

C. DESCHAMPSIOIDES Trin.—DIOMEDE ISL.: Nos. 1649, 1651, 1652 and 1658. See Porsild in Trans. Roy. Soc. of Can. Ser. 3, Sect 5, **32**: 27 (1938).

C. NEGLECTA (Ehrh.) Gaertn.—YUKON R.: Kokrines, No. 615. NORTON SD.: Pastolik, No. 895. SEWARD PEN.: north coast, Kiwalik, No. 1455; Buckland R., No. 1506. Common in low tundra in the Bering Sea region.

C. NUTKAENSIS (Presl) Steud. *C. aleutica* Trin.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 396.

Not previously recorded from north of the Pacific coast and the Aleutian chain.

C. PURPURASCENS R.Br.—FAIRBANKS: College, No. 216. ALASKA RANGE: Nenana Valley, Lignite, No. 279; Healy, No. 323; Richardson Highw., between Summit and McCarty, Nos. 395, 397 and 398. HEAD OF CHITINA R.: *H. M. Laing*, No. 12. Known also from Seward Pen. (Scribn. & Merr.).

DESCHAMPSIA CESPITOSA (L.) Beauv.—ALASKA RANGE: Mts. between Healy and Moody Cr. No. 245; Richardson Highw., between Summit and McCarty, No. 390. KOKRINES MTS.: divide towards Melozitna R., No. 697. SEWARD PEN.: south coast, Bluff, No. 1183; Nome, No. 1313. Common throughout the region.

TRISETUM SIBIRICUM Rupr. *T. flavescens* of authors, not (L.) Beauv.—NORTON SD.: hills back of Pastolik, No. 893; Pastolik, No. 956. SEWARD PEN.: Port Clarence, No. 1414. In northwest Alaska previously known from the last mentioned place only.

T. SPICATUM (L.) Richt. var. MAIDENII (Gand.) Fern.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 382. KOKRINES MTS.: divide towards Melozitna R., No. 706. NORTON SD.:

hills back of Pastolik, No. 892; Pastolik, No. 957. Seward Pen.: north coast Buckland R., No. 1509. Diomede Isl.: No. 1648 (the last perhaps is var. *molle*). Common throughout the region.

Beckmannia Syzigachne (Steud.) Fern. in Rhodora, **30**: 24 (1928).—Yukon R.: Kokrines, No. 618. Previously known from Fort Yukon (Scribn. & Merr.).

Dupontia psilosantha Rupr. *D. Fisheri* auth., non R. Br. saltem quoad pl. A1.—Yukon Delta: Kotlik, Nos. 853 and 854. Norton Sd.: Qiqertariaq, No. 1034. Seward Pen.: south coast, bluff, No. 1190; Port Clarence, No. 1411 (a viviparous form). Common in wet, brackish meadows throughout the Bering Sea region.

Poa alpigena (Fries) Lindm.—Alaska Range: Richardson Highw., Castner Glacier, No. 462-A. Seward Pen.: Nome, No. 1310. Both are proliferous forms. Probably common throughout the region.

P. alpina L.—Alaska Range: Richardson Highw., between Summit and McCarty, No. 391; Castner Glacier, No. 461; Paxon, No. 572. Seward Pen.: Nome (*Eastwood*). Rare or occasional in mountains of the interior.

P. arctica R. Br. *P. rigens* Hartm.—Alaska Range: Richardson Highw., Castner Glacier, No. 463; Yukon Delta: Kotlik, No. 852. Norton Sd.: Pastolik, No. 953; Unalaklet, No. 1133. Seward Pen.: Port Clarence, No. 1413; north coast, Buckland R., Nos. 1520 and 1521. Diomede Isl.: Nos. 1653 to 1656. Common in dry tundra throughout the region.

P. eminens Presl. *P. Trinii* Scribn. & Merr.—Norton Sd.: Qiqertariaq, No. 1070; St. Michaels, No. 1027. Seward Pen.: Nome, *Thornton* (no number) (T). Common on sea-shores of the Bering Sea region, north to Seward Pen.

P. gaspensis Fernald in Rhodora, **31**: 46 (1929).—Kokrines Mts.: divide towards Melozitna R., dry ridges 1500 to 2000 feet above sea level, No. 703.

Our specimens were tentatively so named by Mrs. Agnes Chase, U. S. Nat. Herb., although this species so far has been found on the Gaspé Peninsula, Que. only. Superficially the material resembles the polymorphic *P. glauca*, but, as pointed out by Mrs. Chase (in litt.), the lemmas are webbed close to the keel.

P. glauca M. Vahl.—Fairbanks: College, No. 215. Alaska Range: Nenana Valley, Healy, No. 324; Richardson Highw., between Summit and McCarty, No. 392; Castner Glacier, No. 462. Kokrines Mts.: divide towards Melozitna R., Nos. 701 and 702. Norton Sd.: Qiqertariaq, No. 1036. Seward Pen.: south coast, Bluff, No. 1186. Common in dry, barren places throughout the region.

P. leptocoma Trin.[1]—Kokrines Mts.: divide towards Melozitna R., No. 704. Diomede Isl.: No. 1657.

[1] *Poa leptocoma*, *P. gaspensis* and *P. Wrightii* (No. 1314 only) were named by Mrs. Agnes Chase, U. S. National Herbarium.

P. WRIGHTII (Scribn. & Merr.) Hitchc. in Am. Journ. of Bot. **2**: 309 (1915). *Colpodium Wrightii* Scribn. & Merr. in Contr. U. S. Nat. Herb. **13**, 3: 74 (1910).—SEWARD PEN.: Nome, No. 1314; north coast, Buckland R., No. 1522.

The type came from E. Asia (Arakamtchatchene Isl., *Wright*, U. S. No. 592344). According to Scribner & Merrill, l. c., the species was known previously from SEWARD PEN.: Port Clarence (*Walpole*).

GLYCERIA GRANDIS Wats.—YUKON R.: Holy Cross, No. 822.

Previously known from S. E. Alaska.

G. STRIATA (Lam.) Hitchc. var. STRICTA (Scribn.) Fern. in RHODORA, **31**: 47 (1929). *G. nervata* (Willd.) Trin. var. *stricta* Scribn.—TANANA R.: Hot Springs, No. 633.

Not previously recorded from Alaska.

PUCCINELLIA ARCTICA (Hook.) Fern. & Weath.—NORTON SD.: Qiqertariaq, No. 1068. SEWARD PEN.: south coast, Bluff, Nos. 1184 and 1185. Common on sea-shores of the Bering Sea region.

P. DISTANS (L.) Parl.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 389. Introduced, but becoming established along the road.

P. PAUPERCULA (Holm) Fern. & Weatherby var. ALASKANA (Scribn. & Merr.) Fern. & Weatherby.—DIOMEDE ISL.: Nos. 1641 and 1644. SEWARD PEN.: Cape Prince of Wales (field notes). Probably common on sea-shores throughout the Bering Sea region.

P. PHRYGANODES (Trin.) Scribn. & Merr.—NORTON SD.: Qiqertariaq; common in salt marshes bordering lagoon, No. 1069.

ARCTOPHILA FULVA (Trin.) Rupr. *Colpodium fulvum* (Trin.) Griseb.—YUKON R.: Holy Cross (field notes). YUKON DELTA: Kotlik, No. 856. NORTON SD.: Pastolik, No. 952; Unalaklet, No. 1135. SEWARD PEN.: Kiwalik, No. 1456; Buckland R., Nos. 1517 to 1519, the last two rare viviparous forms. DIOMEDE ISL.: No. 1647. Common in wet meadows on the lower Yukon and in the Bering Sea region.

FESTUCA ALTAICA Trin.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 117. ALASKA RANGE: Richardson Highw., Paxon, No. 518. NORTON SD.: Unalaklet, No. 1134. Occasional in dry open woods and thickets, north to Seward Pen.

F. BRACHYPHYLLA Schultes. *F. brevifolia* R. Br.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 464. KOKRINES MTS.: divide towards Melozitna River, No. 699. NORTON SD.: hills back of Pastolik, No. 896; hills back of Unalaklet, No. 1132. Common in dry, barren places throughout the region.

F. RUBRA L. var. ARENARIA (Osbeck) Fries.—ALASKA RANGE: Nenana Valley, Lignite, No. 280. NORTON SD.: Pastolik, No. 950; Unalaklet, Nos. 1103 and 1104. SEWARD PEN.: south coast, Bluff, Nos. 1180 and 1181; Port Clarence, No. 1411-A; north coast, Buckland R., Nos. 1515 and 1516.

Festuca rubra in Alaska is most variable in regard to shape of panicle, number of flowers in the spikelets and the degree of pubescence of the floral bracts. Differing from all the above by their low culms, open panicles and entirely glabrous lemmas, short awns and long anthers, are the following: Seward Pen.: south coast, Bluff, Nos. 1178 and 1179.

F. vivipara (L.) Sm.—Seward Pen.: Nome, No. 1311.

Apparently not previously recorded from Alaska.

Bromus ciliatus L. *B. Richardsoni* Link. See Hultén, Fl. Kamtch. **1**: 148 (1927).—Tanana R.: Hot Springs, alluvial banks, No. 634.

B. pacificus Shear in U. S. Dept. Agr. Div. Agrost. Bull. **23**: 38, fig. 21 (1900).—Seward Pen.: south coast, Bluff, No. 1187; north coast, Buckland R., No. 1514.

Our specimens have lax, open and more or less nodding panicles; the glumes and lemmas are pubescent.

B. Pumpellianus Scribn.—Alaska Range: Richardson Highw., between Summit and McCarty, No. 387. Previously known from the upper Yukon and Fairbanks region.

B. Pumpellianus Scribn. var. **arcticus** (Shear), n. comb. *B. arcticus* Shear in Scribn. & Merr. in Contr. U. S. Nat. Herb. **13**, 3: 83 (1910); *B. ciliatus* sensu Rothr., Sketch Fl. Al. 458 (1867), non L.; *Schedonorus ciliatus* (L.) Kjellm., Vega Exp. **1**: 557 (1882); Ostf., Fl. Arct. **1**: 132 (1902); as to plant, not as to name-bringing synonym. — Alaska Range: Nenana Valley, Healy, No. 326. Seward Pen.: Port Clarence, *Walpole*, No. 2066 (US).

The writer, having studied *B. arcticus* in the field for a number of years, has come to the conclusion that there does not seem to be sufficient reason for maintaining it as a separate species. It seems more logical to regard it as an arctic-alpine variety of the more widely distributed *B. Pumpellianus*. *B. arcticus* fairly well matches the description of *B. Pumpellianus* Scribn. var. *Tweedyi* Scribn. in Beal, Grasses of N. Am. **2**: 622 (1896); but the type, Yellowstone Pk.: *Fr. Tweedy*, No. 587 (US), is a very different plant, having a pale green panicle and lemmas covered with lustrous, whitish pubescence, whereas the glumes are almost glabrous and the sheaths sparingly hirsute. The arctic plant has very hirsute sheaths, and leaves that are mostly hirsute on both sides. The nodes are covered by densely matted white hair. The glumes are always hirsute and the lemmas strongly so. The awns are somewhat shorter and the lemmas more blunt than in the species. Observations in the field have shown that

the degree of pubescence varies somewhat with the age of the plant (see also Hultén, Fl. Kamtch. **1:** 147 (1927)). Occasional in sandy places in the Bering Sea region north to Kotzebue Sd., also in high mountains of the interior through Yukon to N. W. Mackenzie.

B. RACEMOSUS L.—YUKON R.: Kokrines, No. 617 (probably introduced).

AGROPYRON LATIGLUME (Scribn. & Sm.) Rydb. *A. violaceum* (Hornem.) Lange var. *latiglume* Scribn. & Sm.—SEWARD PEN.: south coast, Bluff, No. 1189.

A. SMITHII Rydb.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 388 (probably introduced).

A. TRACHYCAULUM (Link) Malte, Ann. Rep. Nat. Mus. of Can. 42 (1932). *A. violaceum* (Hornem.) Lange var. *virescens* Lange, Consp. Fl. Groenl. 155 (1880).—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 385. SEWARD PEN.: north coast, Buckland R., No. 1523.

HORDEUM JUBATUM L.—A common weed throughout the interior, north at least to the limit of horticulture.

ELYMUS ARENARIUS L. ssp. MOLLIS (Trin.) Hultén.—NORTON SD.: Qiqertariaq, No. 1071. SEWARD PEN.: south coast, Bluff, No. 1188; north coast, Buckland R., No. 1524. (The last number is f. COMPOSITUS Abromeit in Bibl. Bot. **8**, 42: 96 (1899), described from Greenland but, according to Hitchcock, Man. of Grasses, 249 (1935), also found on the coast of Washington.) DIOMEDE ISL.: No. 1659. Common on sandy beaches throughout the Bering Sea region.

E. INNOVATUS Beal.—ALASKA RANGE: Broad Pass, No. 10; Nenana Valley, Healy, No. 325; Richardson Highw., between Summit and McCarty, No. 386. Sandy places in mountains of the interior of Alaska and Yukon Territory, east to the Mackenzie.

The report, in Scribner & Merrill in Contr. U. S. Nat. Herb. **13**, 3: 89 (1910), from Cape Smythe (near Pt. Barrow), based upon a specimen collected by *Schrader*, 1901, is probably due to a confusion of labels. Schrader, in 1901, crossed the Endicott Mts. of northern Alaska by way of John R., the Anaktuvuk and Colville Rivers.[1] Two years before Schrader collected this species on Chandlar R., also in the Endicott Range; and the "Cape Smythe" plant may well have been gathered on the John River.

(*To be continued*)

[1] F. C. Schrader, U. S. Geol. Surv. Professional Papers 20 (1904).

POLLINATION OF VERBENA HASTATA

Harvey B. Lovell and John H. Lovell

Verbena hastata L., the purple vervain, is widely distributed from Nova Scotia to British Columbia, southward to Florida and New Mexico. The plant flourishes in damp fields and pastures, and, twice in twenty-four years in Iowa, during years of excessive moisture, it has bloomed in great profusion in low fertile lands and yielded a surplus of mild white honey. Robertson[1] has reported a list of insect visitors for Carlinville, Illinois, but a description of the ecology of this important species has never been published.

The slender whorls of flowers begin to bloom at the base of the spike, the flowering gradually continuing upward to its apex. An average of 6 to 7 flowers bloom at one time but, although each whorl blooms only for a few days, the period of anthesis extends over two months. So close together are the clusters of spikes that honey-bees were observed to cross from one to another without flying. This close grouping also greatly increases the conspicuousness of the inflorescence.

The homogamous flowers are sessile, salver-formed and slightly two-lipped, the two upper corolla-lobes being smaller and nearer together than the three lower. The tubular calyx is five-toothed with the two outer teeth prolonged and bent inward to afford support to the flower when it is visited by large insects. The corolla-tube is 3–4 mm. in length, curving obliquely outward, affording more room for the expanding buds and the most convenient position for the bees while sucking. The limb of the corolla, which often stands nearly vertical, is 5 mm. broad with the entrance to the tube closed by a grating of purplish hairs, except for a small opening in the center through which the proboscis of the bee passes. This ring of hairs is useful in excluding both the rain and very small insects.

The stamens are didynamous; the upper pair of anthers lie close to the entrance to the corolla-tube, while the second pair are on the opposite side of the tube a little lower down. The yellow pollen, which is glutinous, adheres to the anthers after they have dehisced. The style is short, about half the length of the corolla-tube, and two-lobed; the outer lobe is stigmatic, large and bulbous, almost completely filling half of the tube. The inner lobe is much reduced in size

[1] Robertson, Charles, Flowers and Insects, Page 216.

and has become smooth and pointed and no longer functions as a stigma. If both lobes were large, the passage of the bee's tongue would be obstructed. The tube between the anthers and the stigma is largely filled with white hairs, which, however, are not dense enough to prevent the passing through it of the proboscis of a large bee. But they would prevent small insects from creeping down to the nectar. In the absence of insects, self-pollination does not occur. We covered three clusters of buds with cheese cloth, before any of them had expanded, and no seed was developed. Nectar is secreted by the base

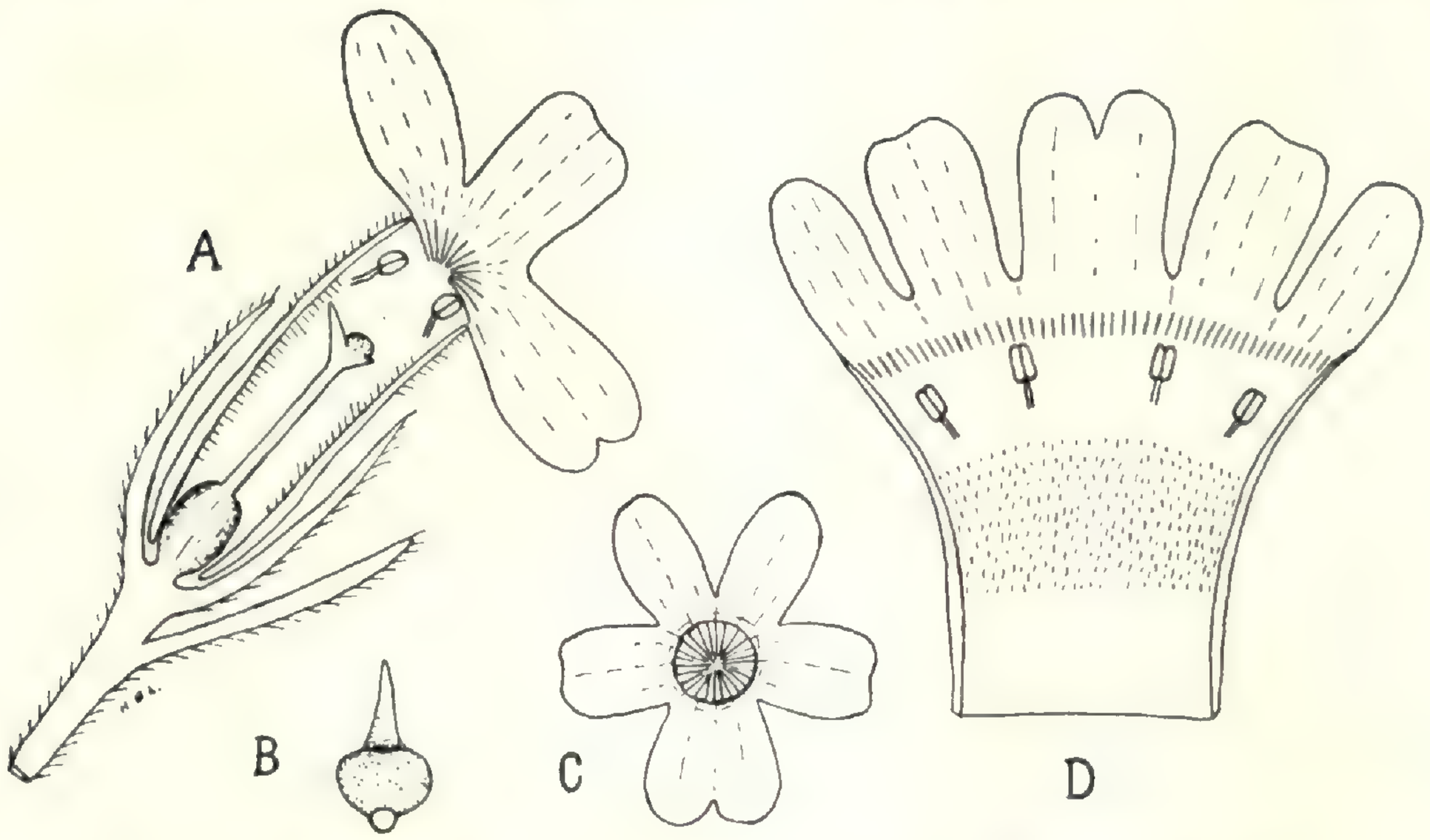


FIG. 1. VERBENA HASTATA L. A, Longitudinal Section of Flower, × 6; B, Stigma as seen from above, × 28; C, Flower from above, showing Grating of Hairs guarding Throat, × 4; D, Inside View of Corolla divided lengthwise with Margins reflexed, × 6.

of the corolla-tube, as was observed by Knuth[1] in the case of V. officinalis L.

When a bee, as a honey-bee, which can easily reach the nectar, for the first time inserts its tongue into a flower of the purple vervain, so little pollen adheres to it that it may or may not effect pollination; but when it is withdrawn wet with nectar, it is so well dusted with pollen that cross-pollination occurs when the bee visits another flower.

A list of the visitors is as follows:

BIRDS. *Trochilidae:* Trochilus colubris L.

HYMENOPTERA. APOIDEA. Long-tongued Bees—*Apidae:* Apis mellifera L. ☿. *Bombidae:* Bombus vagans Sm. ☿, B. terricola Say ☿, B. ternarius

[1] Blütenbiologie, Eng. Ed. Vol. III, page 242.

Say ☿, Psithyrus laboriosus Fab. ♀ ♂. *Euceridae:* Melissodes agilis var. aurigenia Cr. ♂, M. illata Lov. & Ckll. ♀ ♂. *Epeolidae:* Triepeolus donatus Sm. ♀, Epeolus pectoralis Rob. ♀, E. sp. ♀. *Nomadidae:* Nomada cuneata Rob. ♀.

Short-tongued Bees—*Andrenidae:* Andrena sp. ♀. *Halictidae:* Halictus lerouxii Lep. ♀ ♂, H. provancheri D. T. ♀ ♂, H. coriaceus Sm. ♀ ♂, H. pectoralis Sm. ♀. *Panurgidae:* Calliopsis andreniformis Sm. ♀ ♂. *Prosopididae:* Prosopis modesta Say, ♀.

Sphecoidea. *Bembecidae:* Bembex spinolae Lep.

Lepidoptera. *Nymphalidae:* Argynnis aphrodite Fab. *Lycaeidae:* Colias philodicae Godt.

Diptera. *Dexiidae:* Rhyncodexia rufipennis Macq. *Syrphidae:* Eristalis transversus Wied., E. tenax L., Sphaerophoria cylindrica Say. *Tachinidae:* Echinomyia decisa Walk.

Hemiptera. *Pentatomidae:* Euschistus fissilis Uhl.

The length of the corolla-tube is 3.7 mm., and of the pistil 2.5 mm., so that the distance between the anthers and the stigma is hardly more than 1 mm. Thus the tongues of many visiting insects can come in contact with them, though not long enough to reach the nectar. The anthers open widely fully exposing the pollen, a large amount of which is often found in old flowers deposited on the glutinous stigma. Three to ten flowers in each circle may be in bloom at the same time.

The ruby-throated humming-bird, the only species of this family of birds found in New England, is only an occasional visitor. The most important pollinator of the purple vervain in this locality is the honey-bee, which visits the flowers very rapidly, as in one instance, 53 visits were counted in one minute. It moves more often from right to left than in the opposite direction, approximately speaking in the ratio of 2 to 1, but seldom traveling around the entire circle before visiting another spike.

The other long-tongued bees are all able to suck the nectar, and thus effect cross-pollination. Worker bumblebees are the most common visitors of this group.

The tongues of most short-tongued bees, as in the genus *Halictus*, where the tongue varies in length from 1 to 1.5 mm., are unable to reach the nectar. Of 46 specimens of this genus collected, 39 were males, belonging to common species. Why so many males were present it is difficult to explain, though they fly only in summer and autumn when the purple vervain is in bloom.

Butterflies are occasionally present, but find the small flowers rather difficult to visit. Most anthophilous flies feed on pollen, as the species of *Syrphus* but they can not reach the nectar, as their tongues

are only two millimeters long, but *Eristallis tenax*, which has a proboscis 7–8 mm. in length, can easily do so. Both the *Dexiidae* and *Tachinidae* can reach the pollen.

Only one specimen of the order Hemiptera was collected. *Euschistus fissilis*, of the *Pentatomidae*, has a hard, 4-jointed beak more than 4 mm. long. It also sucks the juices of leaves and of caterpillars.

Waldoboro, Maine

ADDITIONAL NOTES ON NAJAS IN MINNESOTA

C. O. Rosendahl

At the time *Najas olivacea* was described[1] it was known from only one station in Minnesota; namely, Norway Lake, Kandiyohi County, in the south-central part of the state, where it was first found in the late summer of 1932. It was again collected at the same place in 1933, but all subsequent attempts to obtain additional material of the species from the type locality have proved fruitless. The apparently complete disappearance of the species from Norway Lake is perhaps to be accounted for by the extensive lowering of the lake level following the severe droughts that prevailed in 1934 and again in 1936. A part of the zone of mucky bottom on which the plant was found has now become exposed, and over the remainder the water has apparently been too shallow for it successfully to maintain itself. Several lakes of the surrounding territory, most of which have suffered less lowering of levels, have been diligently searched for possible additional stations, but uniformly without success. However, in the early summer of 1937, Mr. John B. Moyle, of the State Conservation Department, discovered the plant growing in great abundance in Snail Lake, situated near the middle of Ramsey County, approximately 5 miles north of the St. Paul city limits. The new station is approximately 100 miles east-southeast of Norway Lake. Its proximity to the Twin Cities has offered opportunity for a more intimate acquaintance with this quite distinct yet apparently long overlooked member of our Najad flora, and the following notes are presented in the hope that they may be of help to those who are on the lookout for the species in other parts of the country.

The plant grows on somewhat mucky lake bottoms, most profusely

[1] Rosendahl and Butters, Rhodora 37: 345. 1935.

at depths of about 1 meter. The stems attain lengths up to 40 cm. and are relatively stout, the lower internodes sometimes measuring 2 mm. in diameter in the living condition. The plants are very turgid, the leaves standing out stiffly, and the stems being so brittle that they break freely at the nodes in the process of collecting and handling.

In monographic and other systematic treatments the genus *Najas* is stated to consist of annual herbs. *N. olivacea* proves to be an exception to the rule since it renews freely from the persistent lower portions of the stems of the previous season. In greenhouse experiments Mr. Moyle has found that the plant propagates readily from the broken off, densely leafy tips of the vigorous vegetative shoots. It seems likely that in nature these shoot tips may act as hibernacula, but so far no direct observations in support of this view have been made.

Unlike the other species of *Najas* occurring within our range *N. olivacea* fruits very sparingly. The relatively few flowers that develop beyond the rudimentary stage are borne almost exclusively on the rather short (5–12 cm. long), first-formed shoots of the season's growth. Very rarely are fruits found on the more elongated, freely branching shoots that develop later. Generally the pistillate flowers are borne at the lower and the staminate at the upper nodes of the flowering shoots, but this is not invariably the rule, as fruits are sometimes found in the higher leaf axils. The quadrilocular anther is very plump, hence the staminate flowers are much more conspicuous in this species than in *N. flexilis*, which has a very slender and unilocular anther.

The pollen grains of *N. olivacea* are oblong-oval in outline (averaging 33 x 62 μ), with finely granular contents, whereas in *N. flexilis* they are much more elongate (averaging 26 x 82 μ) and coarsely granular. The pollen of *N. guadalupensis* is similar in shape to that of *N. olivacea* but slightly smaller (27 x 51 μ) and coarsely granular as in *N. flexilis*.

Extensive collecting of aquatic plants incident to a survey of Minnesota lakes by the State Conservation Department has resulted in considerable extension of the known ranges of all the *Najas* species occurring in the state. Thus, *N. marina*, which previously has been reported only from Big Stone and Pope Counties has now been found in Kandiyohi and Norway Lakes in Kandiyohi County and also in Maple Lake in Polk County, about 15 miles east of Crookston in the Red River Valley. The water in all the lakes where this species has

been collected is relatively high in dissolved carbonates and sulphates, but not to the extent of being brackish.

Najas gracillima, previously known only from a single small pond in Ramsey County has recently been collected in two additional widely separated localities, one of which is in Cook County in the extreme northeastern corner of the state, the other at the headwaters of the Mississippi River in Itasca Park.

Of *N. guadalupensis* only two earlier collections have been reported. Both of these were made about 40 years ago in the extreme southeastern part of the state. During the last two seasons the species has been collected in Hennepin, Freeborn, Martin, Renville, Yellow Medicine, Swift, Lac qui Parle, and Lincoln Counties. The known range of the species has accordingly been extended some 75 miles northward and clear across the southern third of the state to the South Dakota boundary.

University of Minnesota

Selenia dissecta in New Mexico.—In a note in Rhodora for November, 1938, Mr. Robert F. Martin calls attention to the discovery of *Selenia dissecta* near Capitan, Lincoln County, New Mexico, April 12, 1929, by Mr. M. W. Talbot (now chief of range research, California Forest and Range Experiment Station). It seems worth while to record that the range plant herbarium of the U. S. Forest Service in Washington, D. C., contains four considerably earlier specimens of this crucifer collected in New Mexico as follows:

Lincoln National Forest, Otero County. (1) Mr. Joe A. Morgan's (a rancher) no. A-2 (Forest Service serial no. 31908). Collected March 15, 1919, at 4300 ft., sandy adobe soil. Sec. 32, T. 17 S., R. 10 E., Morgan's Ranch. Associated with *Euklisia valida* and *Sophia ochroleuca*.

In Mr. James T. Jardine's report on this specimen (prepared by myself) to the Regional Forester at Albuquerque, under date of January 5, 1920, this comment was made: "Apparently the first record of the occurrence of this species in the State of New Mexico; it is a rather little known species hitherto reported only from extreme western Texas near the New Mexico border."

Jornada Experimental Range, Doña Ana County. (2) Paul B. Lister's no. 347 (Forest Service serial no. 42276). Collected February 28, 1923, at 4600 ft., in granitic soil. (3) Paul B. Lister's no. 361 (Forest Service serial no. 45874). Collected April 20, 1923, at

4300 ft. (4) J. D. Schoeller and R. S. Campbell's no. 503 (Forest Service no. 51402). Collected February 1, 1926, at 4300 ft. Associated with tobosa and burrograss.—W. A. Dayton, Forest Service, Washington, D. C.

THE ASTER NOVAE-ANGLIAE, ASTER AMETHYSTINUS, ASTER MULTIFLORUS COMPLEX

Ralph H. Wetmore and Albert L. Delisle

In 1841,[1] Nuttall described and named *Aster amethystinus* from certain specimens found "in Massachusetts, near Cambridge and Salem, rare." This species was indicated as a "well marked and ornamental species, somewhat allied to *A. graveolens*, intimately to *A. novae-angliae*, but from which it is entirely distinct, the flowers not half the size, pale blue, very numerous, and disposed in a panicle, etc."

Suspicion of the possible hybrid nature of *A. amethystinus* was finally crystallized by Benke[2] in 1930. He epitomized the situation as follows, "The presence in close proximity of the two species before mentioned"—*A. novae-angliae* L. and *A. multiflorus* Ait.[3]—"in each case observed and the striking intermediate characteristics of the plant between the two furnish added circumstantial evidence that this charming aster may, with good reason, be regarded as a hybrid."

Later in the same year, Knowlton[4] mentioned his experiences with this species in northwestern Massachusetts and southwestern Vermont, the site of Eggleston's original report of this species for Vermont. Here again he found both parents scattered around in "considerable profusion." His concluding sentence was pointed, "It would be a very interesting project for some botanical garden or experiment station to breed this interesting hybrid artificially for comparison with wild plants."

Further comments[5] on the presumed hybrid nature of this species of *Aster* have been forthcoming from time to time. An examination of

[1] Trans. Am. Phil. Soc., ser. 2, 7: 294. 1841.

[2] Rhodora 32: 1–3. 1930.

[3] The name *A. multiflorus* Ait. is used here because of its general occurrence in Gray's Manual, 7th ed., and other floras, instead of *A. ericoides* L. which, as Mackenzie and Blake point out, antedates it and under which the original description was made. Mackenzie, K. K. Rhodora 28: 65. 1926. Blake, S. F. Rhodora 32: 136–140. 1930.

[4] Rhodora 32: 185–186. 1930.

[5] Professor A. J. Eames reported to the senior author in a personal communication that he had produced *Aster amethystinus*-like plants experimentally by pollinating *A. multiflorus* stigmas with pollen from *A. novae-angliae*. He indicated that plants representing this cross are now in the herbarium at Cornell University.

the specimens found under this designation in the herbaria of the New England Botanical Club and in the Gray Herbarium brings out strikingly two points, (1) that the plants do combine the characters of the supposed parents, and (2) that they do so in every conceivable combination so that an almost graded series can be made from *A. novae-angliae*-like plants to those like *A. multiflorus*.

In the course of field, greenhouse and laboratory study of the genera Aster and Solidago, the senior author chose this species for genetical study in the hope of understanding something of the polymorphy present. The results of this work are appearing in considerable detail elsewhere.[1] The genetical work has been carried out by the junior author. Plants typifying the parents, crosses, backcrosses, etc. have been transplanted to the Harvard Botanic Garden, Cambridge. Pressed specimens have been placed in the Gray Herbarium.

The results of these studies may be summarized as follows:—

1. The two supposed parents, *A. novae-angliae* and *A. multiflorus* are self-sterile and reciprocally interfertile.

2. The F_1 hybrids are intermediate between the two parents and phenotypically rather uniform.

3. These F_1 plants are interfertile, providing a high percent of viable seed.

4. The F_2 population resulting is exceedingly variable, the characters studied not lending themselves to simple Mendelian analysis.

5. The backcrosses of the F_1 hybrids with the two parents give progenies which exhibit a polymorphy grading from the F_1's to either parent.

6. A comparison of the forms produced in these genetic studies with those found in the collections of the Gray Herbarium and the Herbarium of the New England Botanical Club indicates that the natural variants can be matched with those genetically produced and that a preponderance of those obtained from Nature can be designated as backcrosses.

7. Utilizing a method suggested by Anderson[2] by which qualitative characters are converted into quantitative numerical values, statistical confirmation is provided for the above interpretation of this interspecific variation.

8. Studies of chromosome numbers and chromosome morphology

[1] Wetmore, R. H. and A. L. Delisle, Am. Jour. Bot. **26**: 1939.
[2] Ann. Missouri Bot. Garden. **23**: 511–525. 1936.

in the parents, the F_1's and the F_2's and the backcrosses of known genetic origin give added support to the above interpretations.

9. A plotting of the distribution of the specimens of the two parents and of those interpreted as *A. amethystinus* Nutt. found in the Gray Herbarium indicates that both parents are found in the regions from which the hybrids have been reported.

The authors therefore confirm earlier opinions that *A. amethystinus* Nutt. includes forms which originated initially from crosses between *A. novae-angliae* L. and *A. multiflorus* Ait. Reports of plants belonging to the *A. amethystinus* complex have been infrequent. Obviously the parents must be reasonably close together if cross pollinations are to occur and F_1's be produced. The laws of chance are, however, against F_1's appearing very often in close geographical relation to one another. In consequence, it is likely that F_2's would be even more rarely produced. However, since F_1's ordinarily occur in proximity to one or both parents, backcrosses might be expected from time to time in the haphazard pollinations by insects. It is significant therefore that the variability of known genetic backcrosses in this complex accords in extent and in pattern with the forms collected in Nature.

The authors suggest therefore that, in highly polymorphic genera such as Aster and Solidago,[1] fortuitous hybridization followed by backcrossing must be considered as a possible contributing factor to interspecific variation.

Biological Laboratories,
Harvard University

[1] Goodwin, R. H. Rhodora **38**: 22–28, 1937.
——— Am. Jour. Bot. **24**: 425–432, 1937.

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DELPHINIUM NEWTONIANUM

Type sheet, × ⅔; insert, fruit, × 1

DELPHINIUM NEWTONIANUM

Large plant, more than 1 m. tall, × 2/5; insert, flowers, × 1

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 41. June, 1939. No. 486.

DELPHINIUM NEWTONIANUM, A NEW SPECIES FROM THE ARKANSAS OZARKS[1]

Dwight M. Moore

(Plates 548 and 549)

The American species of the genus *Delphinium* are so consistent in their racemose or spicate inflorescence that any very different form is certain to attract attention.

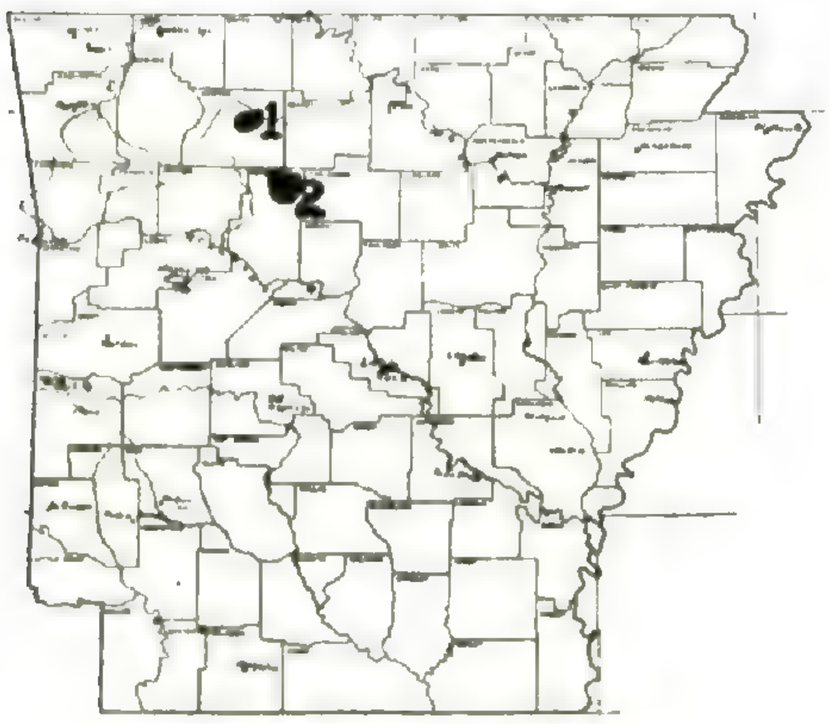
On July 4, 1935, while the writer was driving south of Jasper, Newton County, Arkansas (station 1 on map), on State Highway No. 7, his attention was caught by some tall, diffusely branched plants of *Delphinium* growing in the edge of the woods along the highway. An examination of the plants showed that they had a very open cymose-paniculate inflorescence instead of the usual racemose, racemose-paniculate or spicate inflorescence. They were associated here with *Campanula americana*, *Cimicifuga racemosa*, and other species of similar habitat. These were photographed and some taken for specimens.

Only a few plants were found in this vicinity but about twenty-five miles farther south near Freeman Springs, Pope County (Station 2 on map), more of this same unusual plant were found extending over two or three miles of woodland. This area is in the Ozark National Forest, consisting essentially of white, black, and red oaks, black gum, American elm, dogwood, and red maple. It has been free of surface fires for several years, and was well covered with undergrowth of various kinds, including, among others: (1) *Arisaema triphyllum* (L.) Schott, (2) *Campanula americana* L., (3) *Cimicifuga*

[1] Research Paper No. 449. Journal Series, University of Arkansas.

racemosa (L.) Nutt., (4) *Eupatorium* spp., (5) *Phlox divaricata* L., (6) *Phlox pilosa* var. *ozarkana* Wherry, (7) *Rubus occidentalis* L., (8) *Sanicula* spp.

Due to a dry season most of the leaves had fallen from these *Delphinium* plants, but a few that were left showed that the lower ones were long-petioled, with deeply lobed blades, quite similar to those of *D. tricorne*. They became less lobed and the petioles progressively shorter toward the inflorescence until the upper floral bracts were sessile, entire, slender, and about one centimeter long. Like *D. tricorne*, also, the three follicles were widely divergent when mature, but about one-third smaller and the plants were very slender and branched above.



Map of Arkansas showing two Stations for DELPHINIUM NEWTONIANUM

The plants arose from perennial, somewhat thickened, branched, tuberous roots, from two to five centimeters long, the divisions of which were nearly parallel or slightly divergent.

Specimens were taken for herbarium sheets and some were kept alive and planted in the writer's garden for further observation and study. They survived the very dry summer of 1936 and have shown that they are not only hardy, but may prove to be a worthwhile addition to the garden varieties of the genus. The same station has been visited each year since that time and further observations made and specimens taken. The flowering period appears to extend from the latter part of May to the middle of July in this locality.

TABLE I. will give some of the features of this plant as compared with *D. tricorne* which it most closely resembles.

TABLE I.

Characters	*D. tricorne*	*D. newtonianum*
Habit	Strict, seldom branching	Open, diffusely branched
Stems	Succulent, fleshy	Slender, not fleshy
Height	1.5–7 dm.	3–13 dm.
Pubescence	None or scarce	General, fine, less below

TABLE I.—*Continued*

Characters	*D. tricorne*	*D. newtonianum*
Leaves, lower		
Petioles	10–15 cm.	8–15 cm.
Blades	Deeply palmately lobed into 3 lobes, each of these further lobed	Deeply palmately lobed into 3 lobes, each of these further lobed; in general not so much so as *D. tricorne*
Upper	Still lobed, but less so	At base of inflorescence with 3 slender lobes, simple or slightly lobed
Pubescence	Moderate on both sides	Only on veins beneath
Pedicels	1–4 cm.	3–5 cm.
Pubescence	Of simple hairs	Of simple and glandular hairs
Flowers		
Color	*Purple-blue* with lavender and white variants	*Bright blue*, lavender and white variants
Sepals	Not wide-spreading	Wide-spreading
Petals	Short; hirsute with yellow or white hairs	Short; hirsute with pale yellow and white hairs
Inflorescence	*Racemose*	*Cymose-paniculate*
Fruits	3, *pubescent* divergent, 1.5 cm. long	3, *glabrous* divergent, 1 cm. long
Time of flowering	April–May	May–July
Fruiting	May–June	July

In order to determine accurately the color of the flowers some of the fresh blossoms were referred to Maerz and Paul's *Dictionary of Color*. The results are given in TABLE II.

TABLE II.

Flower Color Diagnosis

Number of Specimens	Color Determination	Number of Specimens	Color Determination
1	34–B–6	7	43–B–11
2	35–B–12	1	43–C–10
1	43–A–6	2	43–C–11
2	43–A–10	2	43–C–12
2	43–A–11	3	43–D–12
1	43–B–7	1	43–E–11
3	43–B–8	1	43–E–12
2	43–B–10	—	
		Total 31	

From this it may be noted that the blue color is reasonably constant,

though variable, but that the mode is number 43-B-11. Extreme variants were not included in the comparison above.

After a careful study of specimens of this plant and checking with approximately 2000 sheets of *Delphinium* in the herbarium at the Missouri Botanical Garden, it is obvious that they represent a new species. In fact, it is so distinct in its inflorescence that there might be a justification for a new section of the genus. However, it has so many features in common with other species in the genus *Delphinium* that it will be considered at present only as a new species. Further study will determine whether or not any other disposition of it may be justified.

The proposed name for this new species, *Delphinium newtonianum* has been selected for two reasons: (1) The plant was first found in Newton County, Arkansas; (2) The writer's first interest in plant study was inspired and his pursuit of it sponsored by Newton H. Moore, his father, of Zanesville, Ohio.

DELPHINIUM **newtonianum**, sp. nov. Herbs with perennial, tuberous, slender, clustered roots 2–5 cm. long; stem simple below, loosely branched above, 3–13 dm. high, branches 0.5–4 dm. long; leaves deeply 3-lobed, each division of lower ones more or less deeply and unequally divided or lobed; petioles of lower leaves 8–15 cm. long, on upper leaves reduced to 1 cm. or less; inflorescence open *cymose-paniculate*, spreading to 7 dm.; stems and leaves puberulent, with simple hairs; those of pedicels and calyx interspersed with straight glandular hairs having elliptical bases; flowers bright blue, or some lavender or white; sepals spreading, 1–1.5 cm. long, spur ascending, often arched or curled, about 2 cm. long; follicles glabrous, strongly divergent. Open woods, May to July; fruiting July. Newton and Pope Counties, Arkansas.

DELPHINIUM **newtonianum**, sp. nov. Herbae cum perennibus, tuberosis, gracilibus, fasciculatis radicibus, 2–5 cm. longis, caule infra simplice, supra laxe ramoso, 3–13 dm. alto, ramis 0.5–4 dm. longis, foliis profundissime partitis in partis tres (quaeque pars foliorum inferiorum plus minusve profunde et impariter partita); petioli foliorum inferiorum 8–14 cm. longi, superiorum 1 cm. aut minus; inflorescentia aperta *cymoso-paniculata* patula ad 7 cm. longa, caulibus et foliis pubescentibus capillis simplicibus, pedicellis et calyce capillis rectis, glandulosis, basi ellipticalibus interspersis floribus aliis clare caeruleis, aliis purpureis aut albis; sepalis patulis 1–1.5 cm. longis; calcare ascendente, saepe fornicato aut crispato, prope 2 cm. longo; folliculis glabris, valdi divergentibus.—Habitat silvas sparsas; flor. Maio-Julio: fruct. Julio. Newton and Pope Counties, Arkansas.

The type selected is deposited in the herbarium of the Missouri

Botanical Garden with co-types at the University of Arkansas, Gray Herbarium, and others.

Collections: No. 350074 TYPE, July 4, 1935, 2 miles s. of Jasper, Newton Co., Arkansas, *D. M. Moore;* no. 350091, COTYPE, July 4, 1935, Freeman Springs, Pope Co., Ark., *D. M. Moore;* no. 350191, July 29, 1935, Freeman Springs, Pope Co., Ark., *D. M. Moore;* no. 4186, June 12, 1936, Freeman Springs, Pope Co., Ark., *D. M. Moore.*

This opportunity is taken by the writer to express his appreciation to Dr. J. M. Greenman, of the Missouri Botanical Garden, for his kind assistance at the herbarium, and to others for their suggestions and assistance.

LITERATURE CONSULTED

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Fayetteville, Arkansas.

A STRANGE RUBUS.—In the Gray Herbarium is an unidentified sheet of Rubus, lacking flowers and fruits, collected some years ago on dry land in mixed woods at Sheboygan, Wisconsin, by Charles Goessl. It is the terminal part of a slender vine-like primocane with curiously

slender and jagged leaflets, well represented in the illustration, PL. 550. It may be a teratological or monstrous form.

In my manuscript I have made this plant a variety of *Rubus alleghcniensis*, but more material should be available before publication and I have written this note to call attention of collectors and curators to it. If anyone has material of it I should like to see the specimens.

Leaflets 5, narrowly lanceolate-caudate, to 5 inches long and 1½ inches broad, margins irregularly lacerate-toothed and lobed, the lowest pair perhaps not more than ½ inch broad; leaves very lightly hairy above, pubescent underneath; petiole and petiolules pubescent and glandular.—L. H. BAILEY, Ithaca, N. Y.

TWO NEW COMBINATIONS IN STEWARTIA.—Miss Sanderson, Librarian of the Gray Herbarium, has called my attention to an article by Britten & Woodward, Journ. Bot. xliii. 268ff. (1905), which seems to have been generally overlooked. In it they produce apparently conclusive evidence that the last part of L'Héritier's Stirpes Novae, though dated 1785 on the title-page, was actually not issued till 1791. Indeed, according to them, L'Héritier himself admitted as much when taken to task by Cavanilles for predating his work.

Stewartia pentagyna L'Hér. was published in this last part of the Stirpes Novae; the same species was described as *Malachodendron ovatum* by Cavanilles in 1787. There is no doubt of the identity of the two; there seems as little that the latter name has four years' priority. The resultant change of epithet is unfortunate, since L'Héritier's name has been in very general use, but unavoidable. Bean's variety, described under *S. pentagyna*, has, of course, to be transferred.

STEWARTIA **ovata** (Cav.), comb. nov. *Malachodendron ovatum* Cav. Diss. v. [302], t. 158, fig. 2 (1787). *S. pentagyna* L'Hér.[1] Stirp. Nov. 155, t. 74 (1791), as *Stuartia*. *Cavanilla florida* Salisb. Prodr. Stirp. 385 (1796). *M. pentagynum* (L'Hér.) Dum.-Cours. Bot. Cult. ed. 2, v. 107 (1811).

Var. **grandiflora** (Bean), comb. nov. *S. pentagyna*, var. *grandiflora* Bean, Trees & Shrubs Brit. Isles, ii. 555 (1914). *Malachodendron pentagynum grandiflorum* E. J. Alexander in Addisonia, xix. 1, t. 609 (1935).—C. A. WEATHERBY.

[1] In Nat. Pflanzenfam. ed. 2, xxi. 134, this name appears as *S. pentagyna* (Dunn) L'Hér. This would seem to indicate that the epithet *pentagyna* had been used before L'Héritier; but Dr. Melchior, who contributed the treatment of *Theaceae*, very courteously informs me, in reply to a query, that the "(Dunn)" was inserted by mistake and that the citation given above is correct.

A STRANGE VITIS-LIKE RUBUS

CAREX KOKRINENSIS, n. sp.: FIGS. 1 and 2, flowering plants, × ⅖; FIG. 3, inflorescence, × 5/3; all from TYPE (Kokrines Mountains, Alaska).

CAREX MELOZITNENSIS, n. sp.: FIG. 4, flowering plant, × ⅖ (TYPE, from Melozitna River, Kokrines Mountains, Alaska).

CONTRIBUTIONS TO THE FLORA OF ALASKA

A. E. Porsild

(*Continued from p. 183*)

Eriophorum angustifolium Roth.—Alaska Range: Richardson Highw., between Paxon and Summit, Nos. 519 and 520. Head of Chitina R.: *H. M. Laing*, No. 15. Yukon Delta: Kotlik, No. 857. Seward Pen.: Port Clarence, Nos. 1416 and 1417; north coast, Buckland R., No. 1526. Diomede Isl.: Nos. 1665 and 1666. Common in wet, marshy places throughout the region.

E. callitrix Cham.—Alaska Range: Mountains between Healy and Moody Creeks, 4000 feet elev., No. 250.

This rare and interesting plant has previously been reported but once from Alaska (Port Clarence, *Kjellm.*). The writer has seen no Alaska material in American herbaria.

E. medium Anders. in Bot. Not. **62** (1857). *E. Chamissonis* C. A. Mey. var. *albidum* sensu Fern., non Nylander. For discussion of synonymy see Hultén, Fl. Kamtch. **1**: 161 (1927).—Cape Lisburne (field notes). Diomede Isl.: No. 1668.

E. opacum (Björnstr.) Fern.—Fairbanks: College, No. 219. Alaska Range: BroadPass, No. 17. Head of Chitina R.: *H. M. Laing*, No. 14. According to field notes common throughout the interior.

E. russeolum Fries. *E. Chamissonis* C. A. Mey.—Yukon Delta: Kotlik, No. 858. Norton Sd.: Pastolik, No. 959. Seward Pen.: north coast, Buckland R., No. 1525. Diomede Isl.: No. 1667. Occasional in silt by the margins of shallow ponds and lakes throughout the Bering Sea region.

E. Scheuchzeri Hoppe.—Alaska Range: Richardson Highw., between Paxon and Summit, No. 521. Kokrines Mts.: divide towards Melozitna R., No. 707. Common throughout the region.

E. vaginatum L.—Seward Pen.: south coast, Bluff, No. 1191; Port Clarence, No. 1418.

Exceedingly common in the Bering Sea region where, in the low coastal tundra, it is the dominant species; in the far interior its place is taken by *E. opacum*.

Eleocharis acicularis (L.) R. & S.—Seward Pen.: north coast Buckland R., Nos. 1527 and 1528 (the last is var. submersa (Hj. Nilss.) Svenson). Very common in lakes of the Buckland R. valley.

Not previously recorded from Alaska.

E. palustris (L.) R. & S.—Yukon R.: Kokrines, No. 619. (var. typica Rouy).

Not previously recorded from Alaska.

SCIRPUS CESPITOSUS L.—ALASKA RANGE: Broad Pass, No. 11. NORTON SD.: Pastolik, No. 960. SEWARD PEN.: Nome, No. 1315; north coast, Buckland R., No. 1529. Very common in low, coastal tundra of the Bering Sea region; in the interior perhaps limited to the mountains. Our plant is var. CALLOSUS Bigel.

KOBRESIA BELLARDI (All.) Degl.—NORTON SD.: Pastolik, No. 897; Qiqertariaq, No. 1038.

From Alaska previously known only from Port Clarence (*Kjellm.*). We found it quite common in dry turfy or gravelly places in the hills of the Bering Sea region.

K. CARICINA Willd. *K. bipartita* (All.) Dalla Torre.—ALASKA RANGE: Nenana Valley, Lignite, No. 282; mountains between Healy and Moody creeks, No. 252. NORTON SD.: Pastolik, No. 961. SEWARD PEN.: south coast, Bluff, No. 1192. Common in the higher mountains of the region and on the Bering Sea coast.

The species appears not to have been recorded previously from the interior of Alaska.

CAREX HEPBURNII Boott.—ALASKA RANGE: Richardson Highw. between Summit and McCarty, No. 399.

New to the interior of Alaska.

C. CAPITATA L.—ALASKA RANGE: Nenana Valley, Lignite, *J. P. Anderson*, No. 1133 (US).

Not previously recorded from the interior of Alaska, but collected on SEWARD PEN.: Nome, *Blaisdell*, 1900 (US).

C. INCURVA Lightf.—SEWARD PEN.: Port Clarence, No. 1422. Common on sandy sea-shores in the Bering Sea region.

C. CHORDORRHIZA Ehrh. apud L. fil.—SEWARD PEN.: north coast, Buckland R., No. 1545.

Not previously recorded from Alaska.

C. DISPERMA Dewey. *C. tenella* Schk.—FAIRBANKS: in a muskeg, No. 166.

Not previously recorded north of S. E. Alaska.

C. TENUIFLORA Wahlenb.—KOKRINES MTS.: *L. J. Palmer*, No. 1626 (US). SEWARD PEN.: north coast, Buckland R., No. 1532. KADIAK ISL.: *Harriman Exp.* No. 2375 (US).

Not previously recorded from northern or central Alaska.

C. LOLIACEA L.—ALASKA RANGE: Nenana Valley, Lignite, *J. P. Anderson*, July 20, 1931 (US).

New to the flora of Alaska.

C. LACHENALII Schk. *C. lagopina* Wahlenb.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, No. 527; Paxon, No.

573. Norton Sd.: Pastolik, No. 972. Seward Pen.: north coast, Buckland R., Nos. 1530 and 1535. Diomede Isl.: Nos. 1660 and 1661-A. Common in turfy places throughout the region.

C. glareosa Wahlenb.—Diomede Isl.: No. 1661 (var. amphigena Fern.). Common on sea-shores of the Bering Sea region.

C. norvegica Willd.—Norton Sd.: Pastolik, No. 962. In northern Alaska previously known from Port Clarence (*Walpole*, No. 1688, (US)) and Kotzebue Sd.

C. brunnescens (Pers.) Poir.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 122. Yukon R.: Ft. Gibbon, *Heidenstam*, No. 157 (US). Matanuska: *J. P. Anderson*, No. 939 (US). Seward Pen.: north coast, Buckland R., No. 1533.

Not previously recorded from northern Alaska.

C. canescens L.—Fairbanks: in a muskeg, No. 163; Goldstream Cr. and Pedro Dome, No. 123. Alaska Range: Broad Pass, No. 13. Seward Pen.: Nome, No. 1318.

C. gynocrates Wormskj.—Fairbanks: in a marl bog, No. 160. Alaska Range: Nenana Valley, Lignite, No. 284; Richardson Highw., between Summit and McCarty, No. 405. Norton Sd.: Pastolik, Nos. 968 and 969.

New to the flora of Alaska.

C. macloviana d'Urv.—Alaska Range: Richardson Highw., Paxon, No. 529.

Our material does not belong to var. *pachystachya* (Cham.) Kükenth. but agrees well with *C. macloviana* from Greenland and Eastern N. America.

C. praticola Rydb. *C. pratensis* Drej.—Fairbanks: College, No. 220. Alaska Range: Nenana Valley, Healy, No. 329; Lignite, *J. P. Anderson*, No. 1136-B (US).

Not previously recorded from northern Alaska.

C. leptalea Wahlenb.—Fairbanks: Nos. 167 and 168. Kokrines Mts.: *B. Miller*, No. 1627 (US).

Not previously recorded from central or northern Alaska.

C. obtusata Liljebl.—Alaska Range: Nenana Valley, Healy, No. 330.

New to the flora of Alaska.

C. supina Wahlenb.—Alaska Range: Nenana Valley, Healy, No. 331; Richardson Highw., between Summit and McCarty, No. 400.

New to the flora of Alaska.

C. scirpoidea Michx.—Kokrines Mts.: Nos. 659 and 660. Seward Pen.: south coast, Bluff, Nos. 1193 and 1194; Nome, *Thornton*, No. 448 (T). Common in turfy places throughout the region.

C. CONCINNA R. Br.—FAIRBANKS: No. 161. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 404. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 17 and 18.

New to the flora of Alaska.

C. RUPESTRIS All.

Kjellman, in Vega Exp. Vetensk. Iakttag. **2**: 58 (1883), reports this species from Port Clarence and later authors have followed him. No one has since collected *C. rupestris* in Alaska, and its general distribution in North America strongly suggests that Kjellman's specimens, which he himself states were sterile, really might have been something else.

C. GLACIALIS Mackenzie. *C. pedata* Wahlenb.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 120.

Previously known from S. E. Alaska only.

C. GARBERI Fern. in RHODORA, **37**: 253 (1935). *C. Hassei* Am. auth. non Bailey, saltem quoad pl. Am. sept.—ALASKA RANGE: Nenana Valley, Lignite, No. 287. Common in the interior, in moist, calcareous places.

New to the flora of Alaska.

C. AUREA Nutt.—FAIRBANKS: No. 164. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 403; Castner Glacier, No. 468.

New to the flora of Alaska.

C. VAGINATA Tausch. *C. saltuensis* Bailey.—FAIRBANKS: No. 165. SEWARD PEN.: Nome, *Thornton*, No. 82 (T); north coast, Buckland R., No. 1541.

In Alaska previously reported from Port Clarence only (*Kjellman*).

C. CAPILLARIS L.—FAIRBANKS: No. 162. KOKRINES MTS.: No. 661. Apparently common in mountains of the interior.

C. CAPILLARIS L. var. NANA (Cham.) Kükenth. in Engler, Pflanzenr. **4**, 20: 591 (1909). *C. nana* Cham. in Steudel, Synops. Cyper. 228 (1855).—ALASKA RANGE: Richardson Highw., Castner Glacier, on fresh moraines near the glacier tongue, No. 467.

Our material of this very striking variety well matches the description in Kükenthal, l. c. The leaves are flat, bright green, almost equalling the culm; the spikelets, numbering from 5 to 7, are from 0.8 to 1.5 cm. long and 10- to 20-flowered, the terminal is gynaecandrous, the lateral pistillate, often branching with one or two, 2- to 5-flowered spikelets from their base. New to the flora of Alaska.

C. WILLIAMSII Britt. in Bull. N. Y. Bot. Gard. **2**: 159 (1901).—ALASKA RANGE: Richardson Highw., between Summit and McCarty,

No. 406. NORTON SD.: hills back of Pastolik, No. 900; Pastolik, dry tundra and ridges, No. 967; Qiqertariaq, No. 1041. SEWARD PEN.: north coast, Buckland R., No. 1542.

C. Williamsii is well separated from *C. capillaris* and its varieties by its narrow and almost subulate leaves and by its loose-flowered, erect spikelets and zigzag rachis. It flowers earlier than the latter and seldom, if ever, pioneers in open, virgin soil, but grows in wet sphagnum. Rare or occasional throughout the region in sphagnum bogs. New to the flora of Alaska.

C. MISANDRA R. Br.—SEWARD PEN.: south coast, Bluff, No. 1201; Nome, No. 1316. Common on the Bering Sea coast.

C. ATROFUSCA Schk. *C. ustulata* Wahlenb.—ALASKA RANGE: mts. between Healy and Moody Creeks, No. 251; Nenana Valley, Lignite, No. 288. NORTON SD.: hills back of Pastolik, No. 899; Pastolik, No. 970. SEWARD PEN.: south coast, Bluff, No. 1197. Thus far recorded only from Port Clarence (*Kjellman* l. c. 56).

C. RARIFLORA (Wahlenb.) Sm.—YUKON DELTA: Kotlik, Nos. 860 and 861. SEWARD PEN.: Port Clarence, No. 1423; north coast, Buckland R., No. 1543. Common everywhere in wet places on the Bering Sea coast.

C. LIMOSA L.—ALASKA RANGE: Richardson Highw., between Summit and Paxon, No. 522.

New to the flora of Alaska.

C. PAUPERCULA Michx. *C. magellanica* auth. non Lam.—SEWARD PEN.: north coast, Buckland R., No. 1540.

Mackenzie in N. Am. Fl. **18**, 6: 351 (1935) reserves the name *C. magellanica* for the South American plant, following Fernald in RHODORA, **8**: 74–75 (1906). Not previously recorded from Alaska.

C. ANGARAE Steud. Synops. Cyper. 190 (1855), based upon *Carex* No. 88, Gmel. Fl. Sib. **1**: 146, tab. 31, fig. 1 (1747). *C. Vahlii* Schk. var. *inferalpina* sensu Fernald in RHODORA, **35**: 220–223, 398, tab. 248 figs. 3, 4, 8 and 9 (1933), non Wahlenb.—FAIRBANKS: Nos. 170, 170-A and 175; College, No. 221. ALASKA RANGE: Broad Pass, No. 15; Nenana Valley, Healy, No. 328. KOKRINES MTS.: divide towards Melozitna R., No. 712. NORTON SD.: hills back of Pastolik, No. 898; hills back of Unalaklet, No. 1138; Golofnin, *L. J. Palmer* No. 1059 (US). SEWARD PEN.: Nome, July 6, 1900, *Flett* (US). Very common throughout the interior, in moist woods and muskegs, occasional in thickets of the Bering Sea region north to Seward Pen.

Following Fernald, the above material should all be named *C. Vahlii* Schk. var. *inferalpina* Wahlenb. which, as pointed out by him, is abundantly distinct from typical *C. Vahlii*. The latter in its distribution is truly arctic-alpine and, in America, is limited to the north-

east; whereas the plant taken by Fernald as var. *inferalpina* is a plant of cold, moist woods, barely reaching north to the tree limit, across the continent from the Strait of Belle Isle to Alaska.

To the writer it seems very doubtful, however, if the American plant discussed by Fernald, l. c., under var. *inferalpina* can be satisfactorily identified with Wahlenberg's plant. Wahlenberg,[1] under *C. alpina* Sw. (*C. Vahlii* Schk.) says: "var. *inferalpina:* capsulis oblongis laevibus, spica terminali saepe mascula." In no form of *C. Vahlii* known to the writer, including var. *inferalpina* of Fernald and var. *Stevenii* (Holm),[2] could the perigynia very well be described as "oblongis laevibus," nor have any been seen in which the terminal spikelet is male. As Fernald points out modern European authors have ignored var. *inferalpina*, but in this connection it may be significant to observe that Neuman,[3] in a note under *C. alpina* var. *inferalpina*, adds: "anses såsom synonym med *C. holostoma* Drej.",[4] whereas Steudel, l. c. 203, definitely accepted *C. Vahlii* β *inferalpina* Wahlb. as a synonym of *C. holostoma*. Now, in that species the perigynia may well be described as "oblongis laevibus" and the terminal spikelet is always male. *C. holostoma* was described by Drejer, Revisio Critica Caricum, 29 (1841), from material collected in Greenland by Jens Vahl. Drejer (l. c. 30) gives as synonym "*C. Vahlii* β *inferalpina* Wahlenb. fl. lapp. p. 241" and remarks: "planta nostra groenlandica exacte cum descriptione cl. Wahlenbergii congruit—." Twenty years later *C. holostoma* was discovered in Norwegian Lapland and in late years it has turned up also in a number of places in arctic Sweden and Finland. Kükenthal and some others have disposed of Wahlenberg's plant as a trivial form of *C. alpina*. Nygren in Sv. Bot. Tidskr., **30**: 138 (1936), suggests that Drejer had not seen specimens of var. *inferalpina*, determined by Wahlenberg himself, which he claims "are nothing but subalpine, exceptionally tall specimens of the ordinary *C. Halleri*."[5] The specimens seen by Kükenthal and Nygren, then, apparently are the cause of the misunderstanding of the true character of var. *inferalpina* but they do not prove that Wahlenberg based his description of var. *inferalpina* on those particular specimens; and,

[1] Fl. Lapp. 241 (1812).

[2] CAREX ANGARAE Steud. var. **Stevenii** (Holm), n. comb. *C. Stevenii* Holm in Am. Journ. Sci., ser. 4, **16**: 21 & 27 (1903); *C. Vahlii* Schk. var. *Stevenii* (Holm.) Fern. in RHODORA, **35**: 223, 398, tab. 248, figs. 5 & 10 (1933).

[3] Sveriges Flora, 699 (1901).

[4] "is regarded as synonym of *C. holostoma* Drej."

[5] The writer's translation of Nygren's Swedish text.

since he did not designate a type, we certainly cannot disregard his quite unequivocal description, especially because typical *C. holostoma* has since been discovered in a number of places in arctic Scandinavia.

Kreczetovicz[1] recently has taken up Steudel's name, with *C. alpina* Sw. var. *inferalpina* Wahlenb. and *C. Vahlii* C. A. Mey. non Schk. as synonyms. The American plant on the whole agrees with Gmelin's description and rather crude plate (l. c.) as well as with the more concise one of Steudel, whereas Kreczetovicz's recent and more detailed description is at variance chiefly when he states that the spikelets are 1.5–2.0 cm. long, 0.6–0.8 cm. wide. These measurements are so far in discord with those given by other writers (Kükenthal, l. c., for *C. alpina* says 5 to 7 mm long) and with measurements of actual specimens that one cannot but feel that Kreczetovicz's figures must be due to a typographical error. On Herb. Fl. Ross. No. 2387A (*Carex alpina* Sw. var. *inferalpina* Wahl.) cited by Kreczetovicz, l. c., a sheet of which is in the Gray Herbarium, the entire inflorescence is about 12 mm. long and the individual spikelets 5 to 6 mm. long.

Carex angarae was described from Angara R., near Lake Baikal, Siberia and according to Kreczetovicz is common in moist forests and thickets, peat bogs and swampy meadows from arctic Europe to Ochotsk Sea. With the American distribution added it thus becomes circumpolar.

C. STYLOSA C. A. Mey.—NORTON SD.: hills back of Pastolik, No. 901. SEWARD PEN.: south coast, Bluff, No. 1200; Port Clarence, Nos. 1419-A and 1421.

Not previously recorded from the mainland of Alaska.

C. PODOCARPA R. Br. in Richards. App. Narrative Franklin Journ. 751 (1824); Hook. Fl. Bor.-Am. **2**: 224, tab. 224 (1840); Kjellm. Vega Exp. **2**: 56 (1883). *C. Tolmiei* Boott in Hook. Fl. Bor.-Am. **2**: 224 (1840); ? *C. montanensis* Bailey in Bot. Gaz. **17**: 152 (1892).—ALASKA RANGE: Richardson Highw., between Paxon and Summit, Nos. 523 and 525. KOKRINES MTS.: No. 662; divide towards Melozitna R., No. 715. SEWARD PEN.: Nome, No. 1317; Port Clarence, Teller, *Walpole*, No. 1570-C (US); Imuvruk Basin, *Walpole*, No. 1732 (US).

The above material, with more numerous specimens from mountains west of the Mackenzie Delta, well matches the excellent description in Kükenthal, l. c. 411, and also Brown's brief but lucid diagnosis which reads: "370 C. podocarpa: spica mascula solitaria, femineis binis pendulis oblongis, stigmatibus tribus, fructibus ellipticis

[1] Fl. U. R. S. S. **3**: 270 (1935).

brevissime rostellatis integris laevibus acheniisque pedicellatis, foliis caulinis inferioribus brevioribus lanceolatis. *Brown, M. S.*" The very short and firm, almost bract-like lower cauline leaves are very conspicuous, especially in mature specimens. Hooker's plate is rather poor; it shows a very young immature plant.

Although, as pointed out by Hultén, Fl. Aleut. 115 (1936), *C. podocarpa* has been much misunderstood, it is a most striking species, in our region at least, not easily confused with anything else. It is a characteristic species of moist, alpine meadows where the snow remains late, in mountains of Alaska and the Yukon Territory, east to the Mackenzie. It forms large, very compact tussocks. The leaves are fresh green, very broad, firm and flat, in age conspicuously tipped with black; the spikelets are long-peduncled, drooping, and from a distance look coal-black.

To the writer it has always seemed strange that Richardson failed to collect *C. atrofusca*, although it is one of the most common sedges of arctic northwest Canada, and it is possible that he himself, in the field, confused it with *C. podocarpa*.

C. **kokrinensis**, n. sp. (TAB. 551, FIG. 1–3). Laxe caespitosa stolonibus brevissimis; culmo phyllopodico 25–35 cm. alto, erecto, gracili et debili, aliquantulum complanato, foliis superante; vaginis inferiore parte purpureis; foliis planis, circa 2.0 mm. latis; spiculis cylindraceis 10–20 mm. longis, erectis, plerumque 4, terminale gynecandra, lateralibus femineis (apice plerumque paucis floribus masculinis) tribus superioribus breviter pedunculatis dense aggregatis, reliquis, si sint, remotiusculis pedunculo dimidio breviore quam spiculo; bractea superiore inflorescentiam aequante, inferiore eam multo superante; squamis atro-fuscis, lanceolatis acuminatis quam perigynia semper angustioribus, brevioribusque vel ea aequantibus, nervo dorsali apicem attingente, conspicuo subviridi; perigyniis ovato-orbiculatis plano-convexis membranaceis, sessilibus enerviis cineraceo-subviridibus laevibus non papillosis; rostro brevissimo subintegro; stigmatibus 2.

Loosely caespitose with very short rootstocks; culm phyllopodic, 25 to 35 cm. high, erect, slender and weak, somewhat flattened, slightly exceeding the leaves; sheaths purplish at the base; leaves flat, about 2 mm. wide; spikelets cylindrical, 10 to 20 mm. long, erect, usually four, the terminal gynaecandrous, the lateral pistillate but generally with a few male flowers near the summit, the upper three short-peduncled, closely aggregated, the fifth when present somewhat distant on a peduncle half as long as the spikelet; uppermost bract equalling, the lower much exceeding the inflorescence; scales black, lanceolate, acuminate, shorter or almost equalling, but distinctly narrower than

the perigynia, with a conspicuous greenish midvein reaching to the apex; perigynia ovate-orbicular, flattened on one side, membranaceous, sessile, nerveless, pale grayish-green, smooth, not papillose; beak very short, sub-entire; stigmas 2.—TYPE: KOKRINES MOUNTAINS: divide towards Melozitna River, in moist alpine meadows, *A. E. & R. T. Porsild,* No. 711. Known thus far only from the type locality.

Apparently a well marked species of the sub-section *Vulgares* Asch., perhaps nearest related to *C. Hindsii* C. B. Clarke.

C. NESOPHILA Holm.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 121. ALASKA RANGE: Broad Pass, Nos. 15 and 16. NORTON SD.: Qiqertariaq, No. 1073. SEWARD PEN.: north coast, Buckland R., No. 1534. DIOMEDE ISL.: No. 1664. Rare or occasional on moist, gravelly mountain slopes.

C. GMELINI Hook. & Arn.—NORTON SD.: Pastolik, No. 964; St. Michaels, No. 1028; Qiqertariaq, Nos. 1039 and 1076. SEWARD PEN.: Port Clarence, No. 1419.

C. Gmelini is common in the Norton Sd. region where it is a characteristic plant in stabilized dunes, associating here with *Poa eminens* and *Elymus arenarius.* Hultén, Fl. Kamtch. **1**: 192 (1927), observes that the species in Kamtchatka is also found inland. We never saw it except near the seacoast. Hooker, Fl. Bor.-Am. **2**: 216, reports *C. Gmelini* as having been collected at Kotzebue Sd. by Beechey; otherwise thus far it has not been recorded from north of the Aleutian chain and the Pribilof Islands.

C. ATROSQUAMA Mackenzie in Proc. Biol. Soc. Wash. **25**: 51 (1912). —ALASKA RANGE: Broad Pass, Nos. 12 and 14; Richardson Highw., between Paxon and Summit, No. 526. Moist, peaty soil in *Picea mariana* muskeg.

New to the flora of Alaska.

C. ALBO-NIGRA Mackenzie in Rydb. Fl. Rocky Mts. 137 (1917).—ALASKA RANGE: Nenana Valley, Healy, No. 327.

New to the flora of Alaska.

C. CONCOLOR R. Br.—SEWARD PEN.: Port Clarence, No. 1420.

Apparently not common in Alaska.

C. AQUATILIS Wahlenb.—FAIRBANKS: Nos. 172 and 174. ALASKA RANGE: Nenana Valley, Lignite, No. 283; Richardson Highw., between Paxon and Summit, No. 528. YUKON R.: Kokrines, No. 621. KOKRINES MTS.: divide towards Melozitna R., No. 710. SEWARD PEN.: north coast, Buckland R., Nos. 1538–B and 1539. Common in wet places throughout the region.

C. AQUATILIS Wahlenb. var. STANS Drej.—YUKON DELTA: Kotlik,

No. 862. DIOMEDE ISL.: No. 1663. Occasional in low tundra of the Bering Sea region.

C. LUGENS Holm in Am. Journ. Sci. **4**, 10: 269 (1900) fig. A–D on p. 268. ? *C. consimilis* Holm; ? *C. yukonensis* Britt. in Bull. N. Y. Bot. Gard. **2**, 6: 159 (1901).—FAIRBANKS: *L. J. Palmer*, No. 242 (US). YUKON R.: Ruby, *Murie*, No. 21 (US); Marshall, No. 843. NORTON SD.: Pastolik, Nos. 965 and 971; Qiqertariaq, Nos. 1040, 1074 and 1075; Unalaklet, No. 1137. SEWARD PEN.: south coast, Bluff, No. 1195; Port Clarence, No. 1424; north coast, Buckland R., Nos. 1531 and 1538-A.

The above material fairly well matches the description of this little known *Carex*. A sheet said to be part of the type number (Kussilof Isl., Alaska, *Walter H. Evans*, No. 725 (Can)), like most of ours, has a few male flowers at the summit of the lateral spikelets. *C. lugens* is a characteristic species of luxuriant, climax-tundra throughout Alaska and Yukon Territory east to the Mackenzie. It forms large, firm tussocks and seems best developed near the northern edge of the coniferous forest, but is not truly arctic.

C. LYNGBYEI Hornem.—YUKON DELTA: Kotlik, No. 863. NUNIVAK ISL.: *B. Miller*, No. 197-C (US). SEWARD PEN.: Nome, THORNTON, No. 362 (US).

In the Bering Sound region apparently rare north of the Yukon delta but has been recorded from Port Clarence (*Kjellman*).

C. MICROGLOCHIN Wahlenb. —ALASKA RANGE: Nenana Valley, Lignite, No. 286, *J. P. Anderson*, No. 1131 (US). SEWARD PEN.: south coast, Bluff, No. 1196; Port Clarence, Teller, *Walpole*, No. 1962 (US). Rare or occasional throughout the region.

C. PHYSOCARPA Presl.—FAIRBANKS: No. 173. ALASKA RANGE: Nenana Valley, Lignite, No. 281; Richardson Highw., between Summit and McCarty, No. 401; between Paxon and Summit, Nos. 524 and 530. KOKRINES MTS.: divide towards Melozitna R., No. 708. SEWARD PEN.: north coast, Kiwalik R., No. 1458. Appears to be common throughout the region but not previously recorded north of the Pribilof Islands.

C. MEMBRANACEA Hook. *C. membranopacta* Bailey.—See Mackenzie in N. Am. Fl. **18**: 454 (1935).—FAIRBANKS: No. 169. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 402. KOKRINES MTS.: divide towards Melozitna R., No. 714. NORTON SD.: hills back of Unalaklet, No. 1139. SEWARD PEN.: south coast, Bluff, Nos. 1198 and 1199. Apparently common throughout the region, but rare in the lowlands of the interior.

C. ROTUNDATA Wahlenb.—NORTON SD.: Pastolik, Nos. 963 and 966; St. Michaels, *Fr. Funston*, No. 229 (G, US); Golofnin B., No.

1172. SEWARD PEN.: Nome, *Flett*, 1900 (US); north coast, Buckland R., Nos. 1536 and 1537. Common on the Bering Sea coast.

C. **melozitnensis**, n. sp. (TAB. 551, FIG. 4). Rhizomate brevi stolones longos tenues emittente (C. chordorrhizae simulante); culmis 30–40 cm. altis gracilibus laevibus obtusangularibus phyllopodicis; foliis culmo paullo brevioribus angustis laevibus valde involutis vel conduplicatis; vaginis pallidis membranaceis; spiculis 3–5, terminalibus 2-4 masculis, subclavatis-linearibus, subsessilibus; unica feminea remotiuscula breviter pedunculata erecta ca. 15 mm. longa, cylindrica, bractea foliosa inflorescentiam superante subtenta; squamis ovatis violaceis, marginibus albis hyalinis, nervo dorsali pallido; perigyniis (immaturis) divaricatis ovalibus inflatis pluri-nervosis laevibus subnitidis flavescentibus, apice in rostrum conicum breve, obscure bidentatum, subito contractis; stigmatibus 3.

Rootstocks short, emitting long, slender and scaly stolons (like those of *C. chordorrhiza*); the culms 30–40 cm. high, slender and smooth with rounded angles, phyllopodic; leaves somewhat shorter than the culms, narrow, smooth, strongly involute or conduplicate; sheaths pale, membranaceous; spikelets 3 to 5, the terminal 2 to 4 staminate, subclavate-linear, subsessile; the single pistillate spikelet remote, short-peduncled, erect, about 15 mm. long, cylindrical, subtended by a leafy bract which slightly exceeds the inflorescence; scales ovate, purplish-brown with white hyaline margins and a pale midvein; perigynia spreading, ovoid, inflated, strongly nerved, smooth and somewhat shiny, greenish straw-coloured, abruptly contracted into a short, conical obscurely bidentate beak; (achenes immature); stigmas 3.—KOKRINES MOUNTAINS: divide towards Melozitna River, growing in shallow water in low wet meadows, June 23 to July 5, 1926, *A. E. & R. T. Porsild*, No. 713 (TYPE). Thus far only known from the type locality where it was very abundant.

A curious species of the *Physocarpae* Drejer of subsect. *Vesicariae* Tuckerm., in habit somewhat similar to *C. rotundata* Wahlenb. but amply separated from it by the long, slender stolons and by the number of staminate spikelets.

C. ROSTRATA Stokes.—FAIRBANKS: Goldstream Cr. and Pedro Dome, Nos. 119 and 119-A; Fairbanks, No. 171. ALASKA RANGE: Richardson Highw., between Summit and McCarty (field notes). YUKON R.: Kokrines, No. 620; Holy Cross, No. 823. SEWARD PEN.: North coast, Buckland R., No. 1544. Common on slough and lake margins throughout the interior, noted on the Yukon River almost to its delta, rare in the Bering Sea region, north to Kotzebue Sound.

CALLA PALUSTRIS L.—FAIRBANKS: Smith Lake near College (noted). YUKON R.: Ft. Gibbon, *Heidemann*, No. 73 (US). Occasional in wet marshy places in the Fairbanks region and on the lower Tanana River.

New to the flora of Alaska.

JUNCUS ALBESCENS (Lange) Fern. See RHODORA **26**: 202 (1924).—ALASKA RANGE: Mts. between Healy and Moody Cr., No. 246; Nenana Valley, Lignite, No. 290. HEAD OF CHITINA R.: *H. M. Laing*, No. 22. SEWARD PEN.: Port Clarence, *Walpole*, No. 1938 (G). Apparently common in moist, calcareous soil in mountains of the interior, less common in the Bering Sea region.

New to the flora of northern Alaska. *Juncus albescens* is certainly very closely related to the Eurasian *J. triglumis* L., but, even in Alaska, where the two species occur together, they may easily be distinguished. To the distinguishing characters given by Fernald, l. c., might be added that the seeds of *J. albescens*, in addition to being smaller than those of *J. triglumis*, are smooth and of a darker brown, whereas in the latter they are somewhat rough and grayish.

Most earlier records of *J. triglumis* from Alaska should be referred to this species.

J. BALTICUS Willd. var. HAENKEI (E. Mey.) Buch.—FAIRBANKS: No. 177. ALASKA RANGE: Broad Pass, No. 19; Nenana Valley, Lignite, No. 291; Richardson Highw., Castner Glacier, No. 471. YUKON R.: Kokrines, No. 622. SEWARD PEN.: south coast, Bluff, No. 1204; Nome, No. 1321; Port Clarence, No. 1426. Common on sandy lake shores and river banks throughout the region.

J. BIGLUMIS L.—ALASKA RANGE: Broad Pass, Nos. 18 and 20; Mts. between Healy and Moody Cr., No. 247; Richardson Highw., between Summit and McCarty, No. 407. KOKRINES MTS.: No. 663. SEWARD PEN.: south coast, Bluff, No. 1203; north coast, Buckland R., No. 1546. DIOMEDE ISL.: Nos. 1674 and 1675. Common on wet cliffs and on moist clayey margins of small ponds throughout the region.

J. BUFONIUS L.—FAIRBANKS: College, No. 217 (near a cow pasture).

J. CASTANEUS Sm.—FAIRBANKS: No. 176. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 409; Castner Glacier, Nos. 469 and 470; between Paxon and Summit, No. 534. KOKRINES MTS.: divide towards Melozitna R., No. 717. NORTON SD.: hills back of Unalaklet, No. 1140. SEWARD PEN.: Nome, 1320; Port Clarence, No. 1427; north coast, Kiwalik R., No. 1459; Buckland R., Nos. 1547 and 1548. Common in alluvial deposits throughout the region; but perhaps as a rule restricted to calcareous soils.

J. NODOSUS L. var. GENUINUS Engelm.—YUKON R.: Kokrines, No. 636 (near the hot springs).

New to the flora of Alaska.

J. TRIGLUMIS L.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 408. NORTON SD.: Pastolik, Nos. 973 and 974. SEWARD PEN.: south coast, Bluff, No. 1202.

In Alaska *J. triglumis* appears to be less common than *J. albescens*. It is the more arctic-alpine of the two and along the north coast of Alaska reaches a short distance east of the Mackenzie where *J. albescens* is absent. *J. triglumis*, unlike *J. albescens*, is not limited to calcareous soils. As noted above most earlier records of *J. triglumis* from Alaska should be referred to *J. albescens*.

Luzula arcuata Wahlenb.—Seward Pen.: Port Clarence, *Harriman, Alaska Exp.* No. 1931 (G); Nome, *Thornton*, No. 210 (US).

L. arcuata is a Eurasian species and barely enters western North America. Samuelsson's statement, in Hultén Fl. Kamtch. **1**: 224 (1927) and idem. Fl. Aleut. 125 (1937), "America: from Alaska to Ellesmereland and Labrador and in the Canadian Rocky Mts. W. and E. Greenland" is certainly erroneous. All *L.* "*arcuata*" east of the Rocky Mts. no doubt should be referred to *L. confusa* Lindebl.

L. confusa Lindebl. *L. hyperborea* R. Br. in part.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 125. Alaska Range: Mountains between Healy and Moody Cr., Nos. 248 and 249; Nenana Valley, Healy, No. 332. Seward Pen.: north coast, Buckland R., No. 1550. Diomede Isl.: Nos. 1672 and 1673. Common on the Bering Sea coast; in the interior apparently restricted to high mountains.

L. japonica Buch.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 126; College, No. 218; Fairbanks, *L. J. Palmer*, No. 245 (US); Ft. Gibbon (near Junction of Tanana R.), *Heidemann*, No. 5 (US). Alaska Range: Broad Pass, No. 22.

Rare or occasional in open, dry *Picea glauca* woods of Central Alaska and the mountains of Yukon Territory. The somewhat questionable record of *L. pilosa* from Kotzebue Sd. in Ledeb. Fl. Ross. **4**: 215, erroneously credited to "Beechey apud Hook.," and copied from Ledebour by Rothrock and other writers, no doubt refers to the present species. The material in our collection matches specimens of *L. japonica* from eastern Asia and differs from *L. saltuensis* Fern. of eastern North America by the caespitose habit, shorter and narrower leaves and much shorter peduncles of the inflorescence. It is new to the flora of Alaska.

L. multiflora s. l.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 127. Alaska Range: Broad Pass, No. 21; Richardson Highw., between Paxon and Summit, No. 531. Yukon Delta: Marshall, No. 845-A; Kotlik, No. 859. Norton Sd.: Pastolik, No. 975; Qiqertariaq, No. 1042. Seward Pen.: Nome, No. 1319.

The above material belongs to a form of the polymorphic *L. multi-*

flora, which is common across sub-arctic North America, from Alaska at least to Hudson Bay. By Professor Samuelsson it has been tentatively segregated as a possibly undescribed species. It may prove to be merely *L. multiflora* (Retz.) Lej. var. *frigida* (Buch.) Sam. It is common throughout the region in dry tundra and reaches north to the edge of the timber.

L. NIVALIS (Laest.) Beurl.[1]—DIOMEDE ISL.: No. 1671.

In Alaska known thus far only from Diomede Islands.

L. NIVALIS (Laest.) Beurl. var. LATIFOLIA (Kjellm.) Samuelsson.—YUKON DELTA: Marshall, No. 845. NORTON SD.: Pastolik, No. 902. SEWARD PEN.: Nome, *Thornton*, No. 80 (T); Port Clarence, *Walpole*, No. 1963 (G); north coast, Buckland R., No. 1549. DIOMEDE ISL.: Nos. 1669 and 1670. Very common in the Bering Sea region.

L. PARVIFLORA (Ehrh.) Desv.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 124. ALASKA RANGE: Richardson Highw., between Paxon and Summit, No. 533. KOKRINES MTS.: divide towards Melozitna R., No. 716. SEWARD PEN.: Nome, *Blaisdell*, 1900 (US). Apparently common throughout the interior in open woods and in willow thickets.

L. SPICATA (L.) DC.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, No. 532.

Common in the Alaska range but rare or absent in the Bering Sea region. Hultén (1937) is hardly correct in giving the distribution of this from "Arctic coast of Alaska to Baffin Island."

L. WAHLENBERGII Rupr. *L. spadicea* var. *Wahlenbergii* Buch.—ALASKA RANGE: Broad Pass (field notes). YUKON DELTA: Marshall, No. 844; Kotlik, No. 864. NORTON SD.: Pastolik, No. 976; *Miller*, Nos. 8-C and 10-C (as *L. arcuata*) (US); St. Michaels, *Fr. Funston*, No. 228 (G). SEWARD PEN.: Port Clarence, No. 1425; north coast, Buckland R., No. 1551.

Luzula Wahlenbergii is very common on the Bering Sea coasts in wet sphagnum tundra. The writer has seen a large series from the region in U. S. National Herbarium, lying chiefly under *L. parviflora*. The species has but recently become recognized in North America but is common from Bering Strait to Hudson Bay and southern Baffin Island. Practically all records in literature of *L. parviflora* from north of the limit of trees should be referred to *L. Wahlenbergii*.

TOFIELDIA COCCINEA Richards.—ALASKA RANGE: Nenana Valley, Healy, No. 334; Richardson Highw., between Summit and McCarty,

[1] For the determination of material in the writer's collection of *Luzula nivalis* and its var. *latifolia*, *L. parviflora*, *L. spicata*, and *L. Wahlenbergii* the writer is indebted to Professor G. Samuelsson, Stockholm.

No. 414; Castner Glacier, No. 475. KOKRINES MTS.: divide towards Melozitna R., No. 719. NORTON SD.: hills back of Pastolik, No. 903; Qiqertariaq, No. 1043; hills back of Unalaklet, No. 1141. SEWARD PEN.: south coast, Bluff, No. 1208. Common on moist gravelly places and occasionally in peaty soil on the Bering Sea coasts and on high mountains of the interior.

T. NUTANS Willd.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 128. YUKON R.: between Ramparts and Tanana, *L. J. Palmer*, No. 40 (US). NORTON SD.: Pastolik, No. 978; Unalaklet, *Palmer & Miller*, No. 1253 (US). GOODNEWS B.: *Harrington*, No. 82 (US). KATMAI REGION: *Hagelbacher*, No. 184 (US). ALASKA PEN.: Lake Illiamna, *Gorman*, No. 104 (G, US). ALEUTIAN ISL.: Akutan, June 1935, *J. Rudd* (G). SEWARD PEN.: Nome, *Thornton*, Nos. 331 and 130-B (US). Apparently rare or occasional in sterile, gravelly places of the mountain regions throughout the region of Alaska and Yukon Territory, east to the mountains west of Mackenzie delta.

Hultén, in Fl. Kamtch. **1**: 230 (1927) revived Willdenow's *T. nutans* and was the first to report it from North America (*Gorman* No. 104) but, in his recent Fl. Aleut. 130 (1937), he has come to the conclusion that *T. nutans* cannot satisfactorily be kept separate from *T. coccinea*. To the writer, who is familiar with both species in the field, *T. nutans* seems well enough distinct from *T. coccinea* and, moreover, as pointed out by Hultén l. c. 230, has a well defined geographical range of its own. In the latter the flowers are very short-pedicelled and never deflexed, the inflorescence is dense, more or less globose, rarely elongated in fruit; while in *T. nutans* the inflorescence is racemose, with distinctly deflexed pedicels equalling the length of the perianth.

T. PALUSTRIS Huds.—ALASKA RANGE: Broad Pass, No. 7; Nenana Valley, Healy, No. 333; Richardson Highw., Castner Glacier, No. 476; between Paxon and Summit, No. 535. KOKRINES MTS.: No. 665. NORTON SD.: Pastolik, No. 977. SEWARD PEN.: Nome, *Thornton*, Nos. 19 and 330 (T); north coast, Buckland R., No. 1552. Common in peaty soil of dry muskegs and tundra throughout the region.

ZYGADENUS ELEGANS Pursh. *Z. chloranthus* Richards.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 413; Nenana Valley, No. 337. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 24, 25 and 26. KOKRINES MTS.: No. 664. SEWARD PEN.: south coast, Bluff, No. 1206; Nome, No. 1322. Common in dry sandy places in the mountains of the interior; occasional in the Bering Sea region.

ALLIUM SCHOENOPRASUM L.—YUKON R.: Birches, No. 605; Kokrines, No. 623. SEWARD PEN.: south coast, Nome, *Thornton*, Nos. 222 and 317 (T); Bluff, No. 1207. A common species on alluvial banks throughout the interior; on the Bering Sea coast noted north to Kotzebue Sd.

VERATRUM ALBUM L. ssp. OXYSEPALUM (Turcz.) Hultén.—KOKRINES MTS.: divide towards Melozitna R., No. 718. SEWARD PEN.: Nome, Anvil Hill, No. 1323; Port Clarence, *Walpole*, Nos. 1619 and 1804 (US). Rare or occasional on fertile but rather dry slopes.

Not previously recorded from the interior of Alaska.

FRITILLARIA CAMSCHATCENSIS (L.) Ker-Gawl.—Noted from several places in the Alaska Range, along the Alaska Railroad, south of Broad Pass but not observed north of the divide. TALKETNA MTS.: *J. P. Anderson*, No. 1053 (US).

The early records from Seward Pen. and Norton Sd. by Rothrock (1867) and by Turner (1886) need verification.

LLOYDIA SEROTINA (L.) Rchb.—ALASKA RANGE: Broad Pass, No. 6. HEAD OF CHITINA R.: *H. M. Laing*, No. 27. NORTON SD.: Pastolik, No. 979. SEWARD PEN.: Solomon Mt., *Thornton*, No. 325 (T); Port Clarence, *Walpole*, Nos. 2005, 2048 and 1421 (US).

A common species in dry grassy places throughout the region, but in the interior of Alaska restricted to high mountains. *Lloydia serotina* flowers soon after the snow leaves the ground. When past flowering it is very hard to see and for this reason is easily overlooked.

STREPTOPUS AMPLEXIFOLIUS (L.) DC. var. AMERICANUS Schultes.—See Fassett in RHODORA, **37**: 88–113 (1935).—ALASKA RANGE: Curry on the Alaska Railroad, south of divide (field notes); Richardson Highw., Castner Glacier, No. 472. Rare or occasional in the Alaska Range, north to the divide.

Previously not recorded except from the south coast. The record by Turner (1886) from St. Michaels in Norton Sd. needs verification.

IRIS SETOSA Pall.—FAIRBANKS: No. 211. YUKON DELTA: Kotlik, No. 865. SEWARD PEN.: Nome, *Thornton*, Nos. 121 and 487 (T). Common in marshy places of the interior; on the Bering Sea coast often in wet, brackish meadows, north to Kotzebue Sd.

CYPRIPEDIUM GUTTATUM Sw.—FAIRBANKS: College, No. 224; Fairbanks, *L. J. Palmer*, No. 1154 (US). ALASKA RANGE: Nenana Valley, Lignite, *J. P. Anderson*, No. 1150 (US). Apparently rare, in open woods.

Not previously recorded from the interior of Alaska.

C. PASSERINUM Richards.—HEAD OF CHITINA R.: *H. M. Laing*, No. 28.

New to the flora of Alaska.

ORCHIS ROTUNDIFOLIA Banks.—ALASKA RANGE: Nenana Valley, Lignite, No. 294. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 36 and 37. Rare or occasional in moist peaty soil.

No previous records from northern Alaska.

Habenaria viridis (L.) R. Br. var. interjecta Fern. in Rhodora 28: 175 (1926). Seward Pen.: Nome, No. 1324.

No previous records from north of the Aleutian chain and the south coast.

H. hyperborea (L.) R. Br.—Fairbanks: No. 178; Richardson Highw., Taylor's Fox Ranch, No. 376. Alaska Range: Nenana Valley, Lignite, Nos. 292 and 293; Richardson Highw., between Summit and McCarty, No. 412; Castner Glacier; No. 473. Head of Chitina R.: *H. M. Laing*, Nos. 34 and 35. Occasional on alluvial banks.

No previous records from northern Alaska.

H. obtusata (Pursh) Richards.—Fairbanks: No. 181; College, No. 223. Alaska Range: Mountains between Healy and Moody Creeks, No. 253; Nanana Valley, Healy, No. 336; Richardson Highw., Castner Glacier, No. 474. Head of Chitina R.: *H. M. Laing*, Nos. 31–33. Norton Sd.: Pastolik, No. 980. Seward Pen.: Nome, *Thornton*, No. 327 (T).

No previous records from the interior of Alaska. A common species of muskegs and cold spruce forest of the interior. Rare or occasional on the Bering Sea coast, north to Kotzebue Sd.

Spiranthes Romanzoffiana Cham. & Schlecht.—Fairbanks: Common in calcareous bog, No. 594.

Goodyera repens (L.) R. Br. *Epipactis repens* (L.) Crantz.—Fairbanks: No. 179. Yukon R.: between Ramparts and Tanana, *L. J. Palmer*, No. 36. Head of Chitina R.: *H. M. Laing*, No. 38-A.

No previous records from interior of Alaska.

Listera borealis Morong.—Fairbanks: No. 182. Head of Chitina R.: *H. M. Laing*, No. 38.

New to the flora of Alaska.

Corallorrhiza trifida Chatelain.—Fairbanks: No. 180; College, No. 222. Alaska Range: Nenana Valley, Healy, No. 335; Richardson Highw., between Summit and McCarty, No. 411; between Paxon and Summit, No. 536. Head of Chitina R.: *H. M. Laing*, No. 29. Yukon R.: Holy Cross, No. 824; common in wooded parts of the region. Recorded from the Kotzebue Sd. region also, but not observed by us.

Calypso bulbosa (L.) Oakes.—Head of Chitina R.: *H. M. Laing*, No. 30.

Populus tacamahacca Mill. *P. balsamifera* DuRoi, not L.—Alaska Range: Richardson Highw., between Paxon and Summit, No. 537. Head of Chitina R.: *H. M. Laing*, Nos. 49–51. Kotzebue Sd.: Napaktolik R., 25 miles above its mouth, No. 6200.

Common on alluvial soils throughout the wooded part of the region; in the mountains its altitudinal limit is considerably above that of the

white spruce. Known in the Bering Sea region at considerable distance from the coast, on the Noatak R., north at least to 68° N.

P. TREMULOIDES Michx.—ALASKA RANGE: Nenana Valley, Lignite, No. 295.

The aspen is common in rich alluvial soils of Central Alaska but neither reaches as high altitudes nor latitudes as does the poplar.

SALIX ALAXENSIS (Anders.) Coville.[1]—ALASKA RANGE: Mts. between Healy and Moody Creeks, No. 254; Nanana Valley, Lignite, No. 296. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 41, 46 and 48. NORTON SD.: Unalaklet, No. 1105; hills back of Unalaklet, No. 1143.

Common throughout the region in well drained alluvial soils, in the Bering Sea region on the Noatak R., north at least to 68° N. In spring the young leaves are very fragrant, like those of *Populus tacamahacca* or even more so.

S. ARBUTIFOLIA Pall.—YUKON DELTA: Kotlik, No. 867. NORTON SD.: Qiqertariaq, No. 1046. A common trailing willow on old sand dunes.

S. ARCTICA Pall. ? × CUNEATA.—ALASKA RANGE: Broad Pass. Common on snow flushes in the alpine zone, No. 25-B.

S. BARRATTIANA Hook.—HEAD OF CHITINA R.: *H. M. Laing*, Nos. 216 and 222.

S. BARCLAYI Anders.—HEAD OF CHITINA R.: *H. M. Laing*, No. 223.

S. BEBBIANA Sarg.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 130. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 43, 45 and 218. A common shrub 10–12 feet high on alluvial banks in the interior.

S. CHAMISSONIS Anders.—SEWARD PEN.: Nome, No. 1326. Common on dry slopes.

S. CRASSIJULIS Trautv. NORTON SD.: Unalaklet, No. 1142.—SEWARD PEN.: Nome, No. 1329. DIOMEDE ISL.: No. 1676-B. The last two × OVALIFOLIA.

S. CUNEATA Turcz.—NORTON SD.: Qiqertariaq, No. 1047; Unalaklet, No. 1142 (× SEEMANII). Occasional on barren windswept hill tops of the Bering Sound region.

An E. Asiatic species new to the flora of N. America.

S. GLACIALIS Anders.—SEWARD PEN.: Nome, Anvil Hill, No. 1330. Common along ditches in the mining district.

S. MYRTILLIFOLIA Anders.—FAIRBANKS: in a wet muskeg, No. 184; HEAD OF CHITINA R.: *H. M. Laing*, No. 221.

S. NIPHOCLADA Rydb.—ALASKA RANGE: Richardson Highw., Castner Glacier, on fresh moraines near the glacier, No. 478.

S. OVALIFOLIA Trautv.—DIOMEDE ISL.: No. 1676-A. Common in wet places in the Bering Sound region.

[1] The willows in the collection were named by Dr. B. Floderus, Stockholm.

S. PHLEBOPHYLLA Anders.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 129. ALASKA RANGE: Richardson Highw., Castner Glacier, No. 477. NORTON SD.: hills back of Pastolik, No. 904; hills back of Unalaklet, No. 1144. SEWARD PEN.: south coast, Bluff, No. 1211 (f. NANA); Nome, No. 1327; north coast, Buckland R., 1553. DIOMEDE ISL.: No. 1677. Common on barren windswept hill tops throughout the region but in the interior perhaps restricted to the higher mountains.

S. PSEUDOPOLARIS Floderus.—ALASKA RANGE: Broad Pass, on snow flushes in the alpine zone, No. 25-A. HEAD OF CHITINA R.: *H. M. Laing*, No. 39.

S. PULCHRA Cham.—SEWARD PEN.: north coast, Kiwalik R., No. 1462. DIOMEDE ISL.: No. 1678.

One of the most common willows of the "Barren Grounds" of Alaska. It is nearly always found along small streams and brooks where it forms almost pure thickets from 5 to 12 feet high. The leaves remain on the branches throughout the greater part of the winter, and on gently sloping coastal plains the dark narrow fringes of this willow clearly stand out against the snow covered landscape, beautifully outlining the drainage system of the slope.

The buds of *S. pulchra* are subject to the attack of a gall-fly and in some years nearly all specimens are infested with galls.

S. RETICULATA L.—ALASKA RANGE: Broad Pass, No. 24. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 44 and 47. SEWARD PEN.: south coast, Bluff, No. 1209 (var. ORBICULARIS (Anders.) Floderus).

Perhaps the most common willow on dry tundra ridges and hilltops. Common in such places throughout the region.

S. RICHARDSONII Hook.—HEAD OF CHITINA R.: *H. M. Laing*, No. 42.

S. ROTUNDIFOLIA Trautv.—SEWARD PEN.: Nome, No. 1328.

S. SEEMANII Rydb.—NORTON SD.: Qiqertariaq, No. 1048. SEWARD PEN.: south coast, Bluff, No. 1210 (forma); Port Clarence, No. 1429; north coast, Kiwalik R., No. 1463. Common in the Bering Sea region.

S. SITCHENSIS Sanson.—HEAD OF CHITINA R.: *H. M. Laing*, No. 40.

ALNUS CRISPA (Ait.) Pursh.—ALASKA RANGE: Broad Pass, No. 23. NORTON SD.: Qiqertariaq, No. 1045. SEWARD PEN.: north coast, Kiwalik R., No. 1461.

According to Hultén, Fl. Kamtch. **2**: 38 (1928) and Fl. Aleut. 154 (1937), the alder of northern Alaska is *A. fruticosa* Rupr., but the writer must admit that he is unable to distinguish the alder seen in Alaska by him from that of northern Canada, Labrador and Green-

land, for which recent writers, following Gray's Man. ed. 7, use the above name.

On mountains, above the timber-line and on the lower, unforested hills of the Bering Sea coasts *A. crispa* in many places forms a dense, almost impenetrable belt, very similar to that described from Kamtchatka by Hultén (1928) under *A. fruticosa*. Due to snow-pressure the branches are decumbent or ascending. In sheltered river valleys and on rich alluvial soils *A. crispa* develops straight trunks and branches, often 25 feet high. In the Kotzebue Sd. region, in places where no timber or drift wood is available, the alder often supplies the bulk of the firewood used at the Eskimo villages. The wood is generally used green and even in this condition makes quite a hot fire.

Betula glandulosa Michx.—Head of Chitina R.: *H. M. Laing*, No. 52. Seward Pen.: north coast, Kiwalik R., No. 1460.

Typical *B. glandulosa* is common in the interior but appears to be rare or at least less common in the Bering Sea region where it seems to be replaced by the following.

B. glandulosa Michx. var. sibirica (Ledeb.) Blake in Rhodora, **17**: 87 (1915). *B. nana* var. *sibirica* Ledeb. Fl. Ross. **3**: 654; ? *B. exilis* Sukatch. (compare Hultén 1929 p. 28 and 1937 p. 153).—Alaska Range: Broad Pass, No. 23-A. Kokrines Mts.: divide towards Melozitna R., No. 720. Yukon Delta: Kotlik, No. 866. Norton Sd.: Qiqertariaq, No. 1044. Seward Pen.: Nome, No. 1325; Port Clarence, No. 1428.

The above six numbers are practically glandless, except for the young branchlets. The leaves are reniform, somewhat broader than long. In No. 886 the wing is half as wide as the nutlet whereas in typical *B. glandulosa* the wing is but from one-quarter to one-third as wide. Also, in the above series the ament-scales are not so deeply lobed as in *B. glandulosa*.

B. papyrifera Marsh.

The paper birch is common in the interior of Alaska but was not observed in the coastal region except at a considerable distance from the sea coast.

Urtica gracilis Ait.—Tanana R.: Hot Springs, No. 637 (near abandoned settlement). Common near human habitations.

Geocaulon lividum (Richards.) Fern. in Rhodora, **30**: 21 (1928). *Comandra livida* Richards.—Fairbanks: No. 202. Head of Chitina R.: *H. M. Laing*, No. 53. Common in the interior and in southern Alaska, but apparently absent from the Bering Sea regions.

Koenigia islandica L.—Seward Pen.: Nome, No. 1331; Port Clarence, No. 1430. Probably common throughout.

Oxyria digyna (L.) Hill.—Alaska Range: Broad Pass, No. 27. Head of Chitina R.: *H. M. Laing*, No. 54. Kokrines Mts.: No. 666. Seward Pen.: Nome, *Thornton*, No. 171 (T). Diomede Isl.: No. 1679. Common in the mountains of the interior; very common on the coast.

Rumex Acetosa L.—Seward Pen.: south coast, Bluff, No. 1213. Diomede Isl.: No. 1681. Observed only on bird cliffs.

R. arcticus Trautv.—Kokrines Mts.: divide towards Melozitna R., No. 721. Norton Sd.: volcanic hills back of Pastolik, moist places in alder thickets, No. 905. Seward Pen.: south coast, Bluff, No. 1214; north coast, Buckland R., wet tundra, No. 1555. Diomede Isl.: No. 1682.

Common or occasional in not too wet tundra throughout the region, but in the interior perhaps restricted to the alpine zone. Our Nos. 905 and 1555 are tall, almost one meter high, with valves 0.6 to 0.7 cm. long, simulating *R. occidentalis* or *R. fenestratus* but, in all, the radical leaves are lanceolate with cuneate, not at all cordate leaf-bases.

R. graminifolius Lamb.—Seward Pen.: Port Clarence, *Walpole*, Nos. 1870 and 1894 (US). Also known from Alaska Pen., Chignik Lake, *Schmitt*, No. 1911, and Kuskokwim Bay, *Sargent*, No. 21 (both US).

R. pallidus Bigel. See Rechinger in Field Mus. Nat. Hist. Bot. Ser. **17**, 1: 71–74, fig. 13 (1937).—Yukon R.: Holy Cross, *Palmer & Miller*, No. 1280 (US). Common on alluvial banks along the Yukon R.

Polygonum alpinum All. var. lapathifolium Cham. & Schlecht. in Linnaea **3**: 38 (1828). *P. polymorphum* L. var. *lapathifolium* (Cham. & Schlecht.) Lædeb., Fl. Ross. **3**: 525 (1850) (Kotzebue Sd.). *P. phytolaccaefolium* Meisn. in Small, Bull. Torr. Bot. Cl. **19**: 360 (1892). *Arconogonum phytolaccaefolium* (Meisn.) Small in Rydb. Fl. Rocky Mts. 238, 1961 (1917).—Kokrines Mts.: divide towards Melozitna R., No. 722. Yukon R.: Anvik, *J. W. Chapman*, No. 12 (G). Norton Sd.: Unalaklet, *Palmer & Johnston*, Aug. 6, 1920 (G); St. Michaels, *J. Muir*, No. 180 (G). Seward Pen.: Port Clarence, *Walpole*, Nos. 1606 and 1647 (US); north coast, Buckland R., Nos. 1554 and 1556. Common throughout, but particularly in the Bering Sea region on well drained, alluvial soils.

It is one of the first perennials to pioneer on new soil, such as slumping riverbanks, landslides, abandoned mining dumps and ditches.

P. Bistorta L.—Alaska Range: Broad Pass, No. 26; Richardson Highw., Castner Glacier, No. 479. Kokrines Mts.: divide towards Melozitna R., No. 723. Norton Sd.: hills back of Pastolik, No. 906.

SEWARD PEN.: south coast, Bluff, No. 1212; north coast, Buckland R., No. 1558. DIOMEDE ISL.: No. 1680. Common throughout the region, in not too wet tundra but in the interior restricted to alpine regions. It is one of the most conspicuous species of dry upland tundra.

P. ? MINIMUM Wats.—SEWARD PEN.: Port Clarence, *Walpole*, No. 1716 (US) as *Koenigia islandica*.

P. ? NATANS A. Eat.—NORTON SD.: Unalaklet, No. 1145 (sterile).

P. VIVIPARUM L.—FAIRBANKS: No. 185. ALASKA RANGE: Nenana Valley, Lignite, No. 297; Head of Chitina R., *H. M. Laing*, No. 55. KOKRINES MTS.: divide towards Melozitna R., No. 724. YUKON DELTA: Kotlik, No. 868. SEWARD PEN.: north coast, Buckland R., No. 1557. Common in rather dry, turfy places throughout the region.

ATRIPLEX GMELINI C. A. Mey.—NORTON SD.: Qiqertariaq, No. 1078. KOTZEBUE SD.: Eschscholtz B., *B. Miller*, No. 67-C (US). Occasional on sandy sea-shores, north to Kotzebue Sd.

CORISPERMUM HYSSOPIFOLIUM L.—YUKON R.: between Ramparts and Tanana, *L. J. Palmer*, No. 13 (US, Can). PORCUPINE R.: *O. Murie*, No. 49 (US).

New to the flora of Alaska. The record from "Pt. Barrow to Mackenzie R." in Pullen's list[1] certainly must be due to a confusion of labels.

CHENOPODIUM CAPITATUM (L.) Asch.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 415. HEAD OF CHITINA R.: 2500 feet above sea level, *H. M. Laing*, No. 56. TANANA R.: Hot Springs, No. 638 (probably introduced). YUKON R.: Birches, No. 606.

MONTIA LAMPROSPERMA Cham.—YUKON DELTA: Kotlik, No. 869. NORTON SD.: Pastolik, No. 981; Unalaklet, No. 1106. SEWARD PEN.: Nome, No. 1332; Port Clarence, No. 1431. Common in brackish meadows of the Bering Sea coast.

CLAYTONIA ACUTIFOLIA Willd.—Port Clarence (*Kjellm.*).

C. ESCHSCHOLTZII Cham. in Linnaea **4**: 561.—ALASKA RANGE: Mts. between Healy and Moody Creeks, alpine slope in wet clay, 3000 feet, No. 258. KOKRINES MTS.: *L. J. Palmer*, No. 1547 (US).

C. Eschscholtzii has not previously been recorded from North America but is known from Eastern Asia. Our specimens match the description in Lædeb. Fl. Ross. **2**: 147. The flowers are very large and creamy-white, in 2–5-flowered racemes. Our specimens are much less robust than *C. acutifolia* Willd., known from both shores of Bering Strait.

C. SARMENTOSA C. A. Mey.—ALASKA RANGE: Broad Pass, No. 34; Richardson Highw., between Summit and Paxon, No. 538. HEAD OF CHITINA R.: *H. M. Laing*, No. 227. NORTON SD.: Unalaklet, No. 1146.

[1] B. Seemann, Bot. Voy. H. M. S. "Herald," 1845–1851, London (1852).

SEWARD PEN.: south shore, Bluff, No. 1215; Nome, No. 1333. DIOMEDE ISL.: No. 1683.

This pretty, pink-flowered *Claytonia* blossoms throughout the summer, and flowers and mature capsules may be found together; the seeds are lentil-shaped, about 1.7 mm in diam., very shiny and black. On bird cliffs at Bluff and on Diomede Isl. the species formed large, almost pure clumps.

C. TUBEROSA Pall.—SEWARD PEN.: Port Clarence, *Walpole*, Nos. 1812 and 1872 (US). DIOMEDE ISL.: No. 1684.

The edible tubers are gathered by the Eskimo (See Porsild, Fl. Diomede Isl. 29 (1937)).

STELLARIA CALYCANTHA (Ledeb.) Bong.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 132. SEWARD PEN.: Nome, No. 1342; north coast, Buckland R., Nos. 1561 and 1563.

Not recorded previously from north of Pribilof Isl. and S. E. Alaska.

ST. CRASSIFOLIA Ehrh.—ALASKA RANGE: Nenana Valley, Lignite, No. 298. TANANA R.: Hot Springs, No. 640. NORTON SD.: Unalaklet, No. 1150. SEWARD PEN.: Nome, No. 1341; Port Clarence, No. 1433; north coast, Buckland R., No. 1562. Common in wet meadows throughout the region.

Not previously recorded from Alaska.

ST. HUMIFUSA Rottb.—NORTON SD.: Qiqertariaq, No. 1081. DIOMEDE ISL.: No. 1686. Common in brackish meadows of Bering Sea coasts.

ST. LONGIPES Goldie.—ALASKA RANGE: Broad Pass, No. 28; Nenana Valley, Healy, No. 344; Richardson Highw., Castner Glacier, No. 485. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 58 and 59. KOKRINES MTS.: divide towards Melozitna R., No. 729. YUKON DELTA: Kotlik, No. 870. SEWARD PEN.: north coast, Buckland R., Nos. 1559 and 1560. DIOMEDE ISL.: No. 1685. Common throughout the region.

CERASTIUM BEERINGIANUM Cham. & Schlecht.—ALASKA RANGE: Broad Pass, No. 31; Richardson Highw., Castner Glacier, No. 487. HEAD OF CHITINA R.: *H. M. Laing*, No. 57. SEWARD PEN.: north coast, Kiwalik R., No. 1465; Buckland R., No. 1564. Occasional throughout the region, but never very common.

In Alaska *C. Beeringianum* seems to take the place of *C. alpina* of which no specimens were seen by us.

C. EARLEI Rydb. in Bull. Torr. Bot. Cl. **30**: 249 (1903).—ALASKA RANGE: Richardson Highw., Castner Glacier, about 4000 feet, No. 486.

With its purplish, acuminate, papery and transparent-margined sepals the above clearly matches typical specimens of this Cordilleran

species, heretofore known only from mountains of Alberta and British Columbia, south to Arizona.

C. FISCHERIANUM Ser.—KOKRINES MTS.: No. 668; divide towards Melozitna R., No. 728. NORTON SD.: Pastolik, No. 986. SEWARD PEN.: Nome, *B. Miller*, No. 236-C (US); north coast, Kiwalik, *B. Miller*, No. 37-C (US). DIOMEDE ISL.: No. 1689. Appears to be common in the Bering Sea region north to Kotzebue Sd.

Not with certainty recorded previously from north of the Aleutian chain.

C. MAXIMUM L.

This handsome, large-flowered *Cerastium* appears to have been collected but once in Alaska, in the Endicott Mts. of northern Alaska: Koyukuk R., *Schrader*, 1899 (US). It is not uncommon in the mountains of northern and central Yukon, north to the arctic coast west of the Mackenzie R. Hultén (1928), no doubt misled by the report of Macoun and Holm in Rep. Can. Arct. Exp. 5A: 11 (1921), which was based upon *C. alpina* (Cape Krusenstern, *J. R. Cox*, No. 751), erroneously gives the American distribution: "Arctic coast of Alaska, eastwards to Coronation Gulf."

SAGINA CAESPITOSA (J. Vahl) Lge.—ALASKA RANGE: Richardson Highw., Paxon, south of divide, No. 574.

S. INTERMEDIA Fenzl. *S. micrantha* (Bunge) Fern. (fide Hultén).—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 489. NORTON SD.: Pastolik, No. 985; hills back of Unalaklet, No. 1148. SEWARD PEN.: Nome, No. 1340; Port Clarence, No. 1432. DIOMEDE ISL.: 1689-A. Fairly common in wet tundra.

ARENARIA ARCTICA Stev.—ALASKA RANGE: Mountains between Healy and Moody Creeks, No. 256. NORTON SD.: Unalaklet, No. 1149. SEWARD PEN.: south coast, Bluff, No. 1219; Nome, Nos. 1337 and 1343; north coast, Buckland R., Nos. 1565 and 1566. Very common in gravelly places of the Bering Sea region; in the interior common on high mountains only.

A. DAWSONENSIS Britton in Bull. N. Y. Bot. Gard. 2: 169 (1901). FAIRBANKS: wet place in a muskeg, No. 187. Although described from Yukon Territory, *A. dawsonensis* does not appear to have been recorded previously from Alaska.

A. HUMIFUSA Wahlenb. *A. ciliata* L. var. *norvegica* auth.; *A. cylindrocarpa* Fern. For a full discussion of the species and its synonymy see Nordhagen, Bergens Mus. Årbog (1935).—ALASKA RANGE: Nenana Valley, Healy, No. 339. SEWARD PEN.: Nome, No. 1344. On moist cliffs in crevices of rock.

A. LATERIFLORA L. *Moehringia lateriflora* (L.) Fenzl.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 132-A; Fairbanks, No.

186. Alaska Range: Nenana Valley, Healy, No. 338. Tanana R.: Hot Springs, No. 639. Norton Sd.: Pastolik, No. 982. Seward Pen.: Nome, *Thornton*, Nos. 23, 175 and 310 (T). A woodland species, common in the interior but rare or occasional in willow thickets of the Bering Sea region.

A. macrocarpa Pursh.—Alaska Range: Broad Pass, Nos. 32 and 33; Mountains between Healy and Moody Creeks, No. 257. Seward Pen.: south coast, Bluff, No. 1220; Nome, *Thornton*, No. 52 (T). Common in moist, gravelly places throughout, but in the interior on high mountains only.

A. nardifolia Ledeb. Fl. Altaica **2**: 166 (1830). *A. capillaris* Am. auth. non Poir.—Alaska Range: Nenana Valley, Healy, 2000 feet, No. 341.

Hultén (1928, p. 85) states that all American material so named differs from either *A. nardifolia* or *A. capillaris* in having "scale-like basal leaves." The above number, with numerous others from the Yukon and N. W. Mackenzie, perfectly matches Ledebour's description as well as Hook. Fl. Bor.-Am. **1**: tab. 32 (1840). *A. nardifolia* inhabits the most barren and dry mountain ridges. It has a strong tap-root with a subligneous caudex and is glabrous throughout, except for the serrate-ciliate margins of the long, linear leaf-blades. The inflorescence is 1–4-flowered, the sepals scarious-margined, half as long as the petals.

A. obtusiloba (Rydb.) Fern. See Rhodora, **21**: 14 (1919).—Alaska Range: Richardson Highw., between Summit and McCarty, No. 416; Nenana Valley, Healy, No. 340. Kokrines Mts.: divide towards Melozitna R., Nos. 725–727. Norton Sd.: hills back of Pastolik, No. 909; Pastolik, No. 987; Qiqertariaq, Nos. 1049 and 1050. Common in dry, sandy places; in the interior on high mountains only.

f. **rosea**, n. forma, petalis roseis, unguibus atropurpureis.

Petals rose-coloured, with deep purplish claws. Seward Pen.: Sawtooth Range, *Thornton*, Nos. 504 (type) and 505 (T and US).

The rose-colored form is not uncommon; it is found also in the mountains of Yukon and west of the Mackenzie Delta. *A. obtusiloba* apparently is new to the flora of Alaska.

A. peploides L. var. major Hook. *Honckenya peploides* (L.) Ehrh. subsp. *major* (Hook.) Hultén.—Norton Sd.: Qiqertariaq, Nos. 1079 and 1080. Common everywhere on sandy beaches along the Bering Sea shores.

A. physodes DC. *Merckia physodes* Fisch.—Kokrines Mts.: No. 667; divide towards Melozitna R., No. 731. Norton Sd.: Pastolik, No. 983. Seward Pen.: Nome, No. 1339; north coast, Kiwalik R., No. 1467; Buckland R., No. 1567. Common on moist

sandy lake- and riverbanks throughout the region; on the Bering Sea shores often in brackish meadows.

A. ROSSII R. Br. in Chloris Melv. 14 (1823); Simmons, Fl. Ellesm. 116, fig. 4–6 (1906).—ALASKA RANGE: Mts. between Healy and Moody Creeks, No. 255. NORTON SD.: Pastolik, No. 984. SEWARD PEN.: Nome, Anvil Hill, Nos. 1334–1336; Bluff, No. 1222. Occasional on moist gravelly soil of high mountains.

A. VERNA L. var. PUBESCENS (Cham. & Schlecht.) Fern.—See RHODORA, **21**: 21–22 (1919).—ALASKA RANGE: Broad Pass, No. 30; Nenana Valley, Healy, Nos. 342 and 343; Richardson Highw., between Summit and McCarty, Nos. 417 and 418; Castner Glacier, No. 490. KOKRINES MTS.: No. 669. SEWARD PEN.: south coast, Bluff, Nos. 1221–1224; north coast, Kiwalik, No. 1464. Common in sandy and gravelly places throughout the region.

CHERLERIA DICRANOIDES Cham. & Schlecht. *Stellaria dicranoides* Fenzl; Seem. l. c. 26. tab. 3 (1852).—SEWARD PEN.: Nome, in dry lichen mats, No. 1338; Mt. Tumit, *Thornton*, No. 421-B (US); Port Clarence, *Walpole*, Nos. 1449 and 1862 (US).

Our material matches the description as well as Seemann's beautiful plate. Previously known from Alaska only from Seemann's collection (Cape Lisburne).

SILENE ACAULIS L. var. EXSCAPA (All.) DC.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 488. HEAD OF CHITINA R.: *H. M. Laing*, No. 60. NORTON SD.: Pastolik, No. 908. Fairly common throughout the region, but in the interior limited to high mountains.

S. REPENS Patr.—ALASKA RANGE: Nenana Valley, Healy, No. 345; Broad Pass, *L. J. Palmer*, No. 1875 (US). Rare or occasional on dry, sandy slopes in mountains of central Alaska.

S. WILLIAMSII Britt. in Bull. N. Y. Bot. Gard. **2**: 168 (1901); see Porsild in RHODORA, **40**: 212 (1938).—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 131; Fairbanks, No. 225. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 61 and 62. KOKRINES MTS.: divide towards Melozitna R., No. 732.

Apparently an endemic species of central Alaska and the Yukon Territory.

MELANDRIUM AFFINE (J. Vahl) Hartm. *M. pauciflorum* (Ledeb.) Ostf.; *Lychnis furcata* (Raf.) Fern.—ALASKA RANGE: Broad Pass, No. 29. HEAD OF CHITINA R., *H. M. Laing*, No. 228. SEWARD PEN.: south coast, Bluff, Nos. 1217 and 1218; north coast, Kiwalik R., No. 1466; Buckland R., *L. J. Palmer*, No. 1040 (US). DIOMEDE ISLAND: No. 1687. Occasional in rocky places throughout; in the interior perhaps restricted to high mountains.

M. APETALUM (L.) Fenzl.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 484. KOKRINES MTS.: divide towards Melozitna

R., No. 730; Kokrines Mts., No. 670. NORTON SD.: hills back of Pastolik, No. 907; Pastolik, No. 988. SEWARD PEN.: Bluff, No. 1216; DIOMEDE ISL.: 1688. Common or occasional in wet tundra throughout the region, but in the interior on the highest mountains only.

M. **macrospermum**, n. sp. (TAB. 552, FIG. 1–3). Planta perennis cum caudicibus plurimis foliosis e radice crassa; caulibus paucis, 15–25 cm. altis dense breviterque pubescentibus non glandulosis, erectis vel aliquantulum adscendentibus, conspicue flexuosis, duobus vel tribus paribus bractearum angustarum attenuatarum purpurascentium foliacearum 2–4 cm. longarum amplexicaulium vel connatarum munitis, nodis valde incrassatis; foliis basilaribus numerosis lanceolatis, 4.0–8.0 cm. longis, 0.4–0.5 cm. latis, prominenter uninerviis, in petiolos atropurpureos alatos attenuatis marginibus nervisque pubescentibus; floribus 1–2 in pedunculis 5–10 cm. longis infra calycem bracteolatis; calyce paullo inflato 1.5 cm. longo, 1.0 cm. lato adpresse lanato, pilibus septatis, nervis purpurascentibus diffusis infra lobos confluentibus; petalis vix exsertis, roseis; semine reniformi, cinnamomeo, 2.0–2.4 mm. lato, 1.8 mm. longo, valde punctato, ala lata inflata.

Perennial from strong, many-headed leafy caudex; stems few, 15 to 25 cm. high, nonglandular, densely pubescent, erect or somewhat ascending, conspicuously flexuous, with 2 to 3 pairs of narrow, attenuate purplish leafy bracts 2–4 cm. long, clasping or connate at much thickened joints; basal leaves numerous, oblanceolate, strongly one-nerved, tapering into dark purplish winged petioles, blade pubescent along the margins and midrib; inflorescence 1–2 flowered, the flowers borne on peduncles 5–10 cm. long, each with a bracteole well below the calyx; calyx urn-shaped, 1.5 cm. long and 1.0 cm. wide, pubescent, with purplish diffuse veins joined below the lobes; petals barely exserted, rose; seeds reniform, pale brown, 2.0–2.4 mm. wide and 1.8 mm. long, strongly punctate, with broad, inflated wing.—NORTON SD.: volcanic hills 15 miles back of Unalaklet, alpine, gravelly slopes 1000–2000 ft, July 29, 1926, *A. E. & R. T. Porsild*, No. 1147 (TYPE). Thus far only known from the type locality.

DIANTHUS REPENS Willd.; Seem. l. c. 27, tab. 4 (1852).—KOKRINES MTS.: divide towards Melozitna R., No. 733. NORTON SD.: Qiqertariaq, No. 1051; Unalaklet, *B. Miller*, No. 251-C (US). SEWARD PEN.: north coast, Kiwalik R., No. 1468. Rare or occasional on volcanic gravels.

Our material matches Seemann's beautiful plate. From Alaska previously known only from the Bering Sea region.

NUPHAR VARIEGATUM Engelm.—FAIRBANKS: No. 595. HEAD OF CHITINA R., *H. M. Laing*, No. 63. YUKON R.: Holy Cross, No. 827. The yellow water lily is common in the lowlands of the interior; along the Yukon it was observed almost to the delta.

CALTHA LEPTOSEPALA DC. *C. Macounii* Greene, Pitt. **4**: 77 (1899). —ALASKA RANGE: Talketna on the Alaska Railroad, *J. P. Anderson*, No. 1016 (US).

Previously known from S. E. Alaska (Sitka).

C. NATANS Pall.—NORTON SD.: Pastolik, No. 992. SEWARD PEN.: Nome, *Thornton*, No. 440 (T); north coast, Buckland R., No. 1569. Fairly common in tundra lakes and bogs of the Bering Sea region.

C. PALUSTRIS L. var. ASARIFOLIA (DC.) Huth. *C. arctica* R. Br.; *C. palustris* L. f. *radicans* (Forst.) Hartm.—FAIRBANKS: No. 190 (with mature fruit on June 14). NORTON SD.: Pastolik, No. 993. SEWARD PEN.: Nome, *Thornton*, No. 72 (T); north coast, Buckland R., No. 1570. Common throughout, in bogs and shallow ponds.

AQUILEGIA BREVISTYLA Hook.—HEAD OF CHITINA R.: *H. M. Laing*, Nos. 73 to 76.

DELPHINIUM MENZIESII DC., Syst. **1**: 355 (1818). ? *D. Middendorffii* Trautv. in Midd. Sib. Reise, **1**, 2: 63, tab. 1 (1847); *D. Blaisdellii* Eastw. in Bot. Gaz. **33**: 142 (1902).—SEWARD PEN.: south coast, Bluff, No. 1230; Nome, *Thornton*, Nos. 17, 193 and 399-A (T). KOTZEBUE SD.: Kivalina, *L. J. Palmer*, No. 213 (US). CAPE LISBURNE: *Washburn*, July 27, 1904 (US). Also known from mountains along the Alaska-Yukon boundary, 65° 30′ N. 141° W., *Mertie*, No. 27 (US).

Eastwood, l. c., says of *D. Blaisdellii*, that the peduncles are "2 mm. long" and "the spur slender, 2.5 cm. long, and tapering to an obtuse apex less than 1 mm. wide." The writer has seen no specimen by Eastwood designated as the type, but in a number of sheets from Seward Pen., including some from the type-locality (Nome), the peduncles are from 2 to 4 cm. long while the spur is from 1.0 to 1.5 cm. long and about 1.5 mm. in diameter. The "dark spot" near the apex of the calyx-lobes described by Eastwood is very conspicuous in life but not always evident in herbarium material. In some specimens the corolla measured 4.2 cm. in diameter.

D. SCOPULORUM Gray var. GLAUCUM Gray. *D. Brownii* Rydb.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 419. HEAD OF CHITINA R.: alt. about 4000 ft., *H. M. Laing*, No. 77. YUKON R.: just above the delta, No. 834. NORTON SD.: Egavik, *Palmer and Johnston*, No. 87 (US). SEWARD PEN.: Port Clarence, *Walpole*, Nos. 1777, 1864 and 1955 (US). Rare or occasional in moist, grassy places, willow thickets and herb-mats.

ACONITUM DELPHINIFOLIUM DC.—ALASKA RANGE: Richardson Highw., Paxon, No. 576. HEAD OF CHITINA R.: *H. M. Laing*, No. 78. KOKRINES MTS.: divide towards Melozitna R., No. 734. NORTON SD.: hills back of Pastolik, No. 910; Qiqertariaq, No. 1052. SEWARD PEN.: Nome, *Thornton*, No. 391 (T); north coast, Buckland R., No. 1568. DIOMEDE ISL.: Nos. 1690 and 1691 (the first is var. ALBIFLORUM A. E. Porsild, Trans. Roy. Soc. Can. Ser. 3, sect. 5, **32**: 29 (1938)). Apparently rare or occasional in the mountains of the interior, common on the Bering Sea coasts, north to Cape Lisburne.

Anemone Drummondii S. Wats., Bot. of Calif. **2**: 424 (1880); *A. baldensis* Hook., Fl. Bor.-Am. **1**: 5, non L.—Norton Sd.: hills back of Pastolik, No. 912; Qiqertariaq, No. 1053. Seward Pen.: south coast, Bluff, Nos. 1226 and 1229; Port Clarence, *Walpole*, No. 2006 (as *A. multiceps*) (US). Rare or occasional on volcanic gravels of Norton Sd. and Seward Pen.; also known from the north coast of Alaska east to the Mackenzie.

New to the flora of Alaska.

A. multifida Poir. var. hudsoniana DC. *A. globosa* Nutt.—Head of Chitina R.: *H. M. Laing*, Nos. 64–66.

A. narcissiflora L. *A. zephyra* A. Nels.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 134. Alaska Range: Broad Pass, No. 35. Norton Sd.: hills back of Pastolik, No. 913; Pastolik, Nos. 990 and 991; Qiqertariaq, No. 1054. Seward Pen.: south coast, Bluff, No. 1228; Nome, No. 1349. Diomede Isl.: No. 1692. Common in dry, gravelly places, north to Seward Pen.

A. parviflora Michx.—Alaska Range: Broad Pass, No. 36; Nenana Valley, Lignite, Nos. 299 and 300; Healy, No. 346; Richardson Highw., between Paxon and Summit, No. 542. Head of Chitina R.: *H. M. Laing*, Nos. 67–69. Kokrines Mts.: No. 671. Seward Pen.: south coast, Bluff, No. 1227; Nome, No. 1350. Common throughout the region in rather dry turfy places. The most common of the anemones.

A. Richardsonii Hook.—Alaska Range: Broad Pass, No. 39; Richardson Highw., between Paxon and Summit, No. 541. Head of Chitina R.: *H. M. Laing*, No. 70. Kokrines Mts.: divide towards Melozitna R., No. 738. Norton Sd.: hills back of Unalaklet, No. 1151. Seward Pen.: Nome, No. 1348; Shismareff, *L. J. Palmer*, No. 1021 (US). Occasional throughout, in moist thickets north to Kotzebue Sd.

Pulsatilla multiceps Greene, Erythrea **1**: 4 (1893). *Anemone Cairnesiana* Greene in Ott. Nat. **25**: 146 (1912).—Norton Sd.: Unalaklet, *L. J. Palmer*, No. 230 (US). Seward Pen.: Nome, *B. Miller*, No. 99-c; *Thornton*, Nos. 69, 127 and 302 (T); Port Clarence, *Walpole*, No. 1455 (US).

There seems to be little doubt that *A. Cairnesiana* is merely a young form of *Pulsatilla multiceps*. From a letter preserved on the files in the National Museum of Canada, dated Nov. 11, 1912, it appears that Greene suspected this possibility but reserved judgment until mature specimens could be obtained. At any rate, three sheets collected by Cairnes, near the type locality for a *A. Cairnesiana*, Yukon: 67° N. 141° W., *D. D. Cairnes*, Nos. 83069–83071, labelled *A. Cairnesiana* on Greene's authority, certainly cannot be distinguished from the co-type of *P. multiceps* (Porcupine R.: *J. H. Turner*, 1891, ex Herb.

Greene No. 2114 (Can)). According to a letter by Macoun, dated Nov. 8, 1912, the type of *A. Cairnesiana* was sent to Greene but apparently was never returned, for there are no specimens now in the National Herbarium of Canada of the type collection of 1911.

Pulsatilla multiceps no doubt is closely related to *P. ludoviciana* (Nutt.) Heller, from which it is distinguished by its much smaller, rotate flowers and generally dwarfed stature; it also appears to be much later-flowering and to have a range distinct from that of *P. ludoviciana.* The two dozen sheets or more seen by the writer of *Pulsatilla* from mountain regions of Alaska all belong here. The fruit of *P. multiceps* is still unknown and a sheet thus labelled from Seward Pen., Port Clarence (*Walpole* 2006, US) proved to be *Anemone Drummondii.*

OXYGRAPHIS GLACIALIS (Fisch.) Bunge in Suppl. Alt. 46 (1836). *Ranunculus kamtschaticus* DC., Prod. **1**: 43 (1824).—SEWARD PEN.: Port Clarence, *Walpole*, Nos. 1479 and 1874 (US).

A very rare plant in Alaska. On the mainland thus far collected but a few times on Seward Peninsula.

RANUNCULUS CHAMISSONIS Schlecht. Animadv. Ran. **1**: 12 (1819). See Porsild in Trans. Roy. Soc. of Can. Ser. 3, sect. 5, **32**: 30 (1938).—SEWARD PEN.: Nome, *Thornton*, No. 401 (T); Cape Pr. of Wales (field notes). DIOMEDE ISL.: No. 1693. A rare plant in Alaska, known only from the above collections.

R. CYMBALARIA Pursh.—NORTON SD.: Qiqertariaq, No. 1082. SEWARD PEN.: Nome, No. 1347; Port Clarence, No. 1435. Common along the shores of Bering Sea, north at least to Kotzebue Sd.

R. ESCHSCHOLTZII Schlecht.—ALASKA RANGE: Richardson Highw., between Summit and Paxon, No. 539.

The report from Kotzebue Sd., and Cape Lisburne by Seemann needs verification. New to the interior of Alaska.

R. HYPERBOREUS Rottb.—ALASKA RANGE: Nenana Valley, Lignite, No. 302. NORTON SD.: Pastolik, Nos. 994 and 995; Unalaklet, No. 1107. SEWARD PEN.: Nome, *Thornton*, No. 133 (T); Port Clarence, No. 1434. Common throughout, in wet moss on margins of small ponds and stagnant sloughs.

R. LAPPONICUS L.—FAIRBANKS: No. 188; College, No. 226. KOKRINES MTS.: divide towards Melozitna R., Nos. 736 and 737. NORTON SD.: Unalaklet, No. 1152. SEWARD PEN.: north coast, Buckland R., No. 1572. DIOMEDE ISL.: No. 1696. Occasional in wet sphagnum bogs and muskegs throughout the region. The flowers are very fragrant.

R. MACOUNII Britt.—FAIRBANKS: in alluvial soil by a stream 10 miles east of the town, No. 189.

Probably new to the flora of Alaska.

R. NIVALIS L.—ALASKA RANGE: Broad Pass, No. 38; Richardson Highw., between Summit and Paxon, No. 540. SEWARD PEN.: Nome, *Thornton*, Nos. 18, 140 and 403 (T). DIOMEDE ISL.: Nos. 1694 and 1695. Rare or occasional on high mountains of the interior; common in herb mats on the Bering Sea coasts.

R. PALLASII Schlecht.—YUKON DELTA: Kotlik, No. 871. NORTON SD.: Pastolik, No. 996; Unalaklet, No. 1108. SEWARD PEN.: Nome, No. 1345; Port Clarence, *Walpole*, No. 1686 (US); north coast, Buckland R., No. 1575. Common in moss and on floating margins of ponds and sloughs along the Bering Sea shores and the north coast of Alaska.

R. PEDATIFIDUS Sm. var. LEIOCARPUS (Trautv.) Fernald in RHODORA, **19**: 138 (1917). See also Fernald in RHODORA, **36**: 93–96 and plates 279, 280 (1934). *R. affinis* R. Br. *R. auricomus* Hook. non L., nec Ledeb.—HEAD OF CHITINA R.: *H. M. Laing*, Nos. 71 and 72. Noted by us on the north coast of Alaska; apparently rare or absent in central and western Alaska.

R. PURSHII Richards. ssp. **yukonensis** (Britt.), n. comb. *R. yukonensis* Britt. in Bull. N. Y. Bot. Gard. **2**: 168 (1901).—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 133. KOKRINES MTS.: divide towards Melozitna R., No. 735. YUKON R.: Holy Cross, No. 825. NORTON SD.: Pastolik, No. 997; hills back of Unalaklet, No. 1153. SEWARD PEN.: north coast, Kiwalik R., No. 1469; Buckland R., No. 1571.

The ssp. *yukonensis* is common in wet moss and on floating margins of ponds throughout Alaska and Yukon eastwards to Bear Lake and Coronation Gulf.

When a large series of *R. Purshii* from across the North American continent is examined it becomes evident that the plant of the northwest differs from that of Atlantic America by the consistently smaller leaves and flowers. There is nothing, however, in Britton's description, l. c., by which it can be satisfactorily distinguished from the eastern plant. In view of the considerable variation in *R. Purshii* it may not be advisable to treat the western plant as a species, but its distinct distribution, on the other hand, suggests a geographical race with a distribution centering around E. Asia and N. W. America. For this the new combination is proposed.

R. PYGMAEUS Wahlenb.—SEWARD PEN.: Nome, No. 1346.

Apparently rare or occasional. Not seen by us in the interior.

R. REPENS L.—YUKON R.: Kokrines, on river banks with *Potentilla pacifica*, No. 624.

New to the flora of Alaska.

R. REPTANS L.—ALASKA RANGE: Nenana Valley, Lignite, No. 301; Richardson Highw., between Summit and McCarty, No. 420. SEWARD PEN.: north coast, Buckland R., Nos. 1573 and 1574. Clay margins of ponds and streams, probably common throughout.

Not reported previously from north of Pribilof Isl. and S. E. Alaska.

R. SCELERATUS L.—NORTON SD.: Qiqertariaq, in a wet meadow bordering lagoon, No. 1083.

New to the flora of Alaska.

R. SULPHUREUS Sol.—

Although this species appears to be common on islands in Bering Strait (Pribilof I., Hall I. etc.) and is known from the north coast (Camden B.), thus far it does not appear to have been recorded from the area visited by us.

R. TRICHOPHYLLUS Chaix var. TYPICUS W. B. Drew in RHODORA, **38**: 18 (1936). *R. aquaticus* L. var. *capillaceus* DC.—ALASKA RANGE: Nenana Valley, Lignite, No. 303. YUKON R.: Holy Cross, No. 826. Probably common throughout the interior.

The var. *cradicatus* (Laest.) W. B. Drew is known from the Aleuts and Pribilof I., but was not seen by us.

THALICTRUM ALPINUM L.—ALASKA RANGE: Richardson Highw., Paxon, No. 575. NORTON SD.: Pastolik, No. 989. SEWARD PEN.: south coast, Bluff, No. 1225.

Rare or occasional in the mountains of the interior; on the Bering Sea coast frequently growing with *Euphrasia mollis* on the side and base of large *Eriophorum vaginatum* tussocks or "nigger-heads" in rather dry tundra.

T. SPARSIFLORUM Turcz.—FAIRBANKS: College, No. 229. TANANA R.: Hot Springs, No. 641. YUKON R.: Holy Cross, No. 828. Fairly common in rich woods of the interior.

Previously known from the south coast only.

PAPAVER ALASKANUM Hultén, Fl. Aleut. 190, tab. 10 (1937). *P. nudicaule* auth. non L. saltem quoad pl. Am. occid. extr.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 421. KOKRINES MTS.: divide towards Melozitna R., No. 740. DIOMEDE ISL.: No. 1697.

The above numbers no doubt belong to *P. alaskanum*, which is closely related to *P. radicatum* Rottb. but which differs from that species by the more slender scapes, narrower and more deeply dis-

secteed leaves and by the long-persisting old stipules. *P. alaskanum* is nearly always found in turfy or peaty soil, in closed vegetation, whereas *P. radicatum* grows in sandy or gravelly places. From *P. microcarpum* and *P. Macounii,* as pointed out by Hultén, l. c., it is at once distinguished by the absence of the central projection of the stigma.

Papaver alaskanum is apparently common in the mountains of the interior, the Bering Sea region and on the arctic coast of Alaska east to Cape Bathurst.

P. MACOUNII Greene, Pitt. **3**: 247 (1897); Macoun, Fur Seal & Fur Seal Isl. of N. Pacific, **3**: 562, tab. 88 (1899).—NORTON SD.: Unalaklet, in old overgrown dunes, near the sea-shore, No. 1109.

P. MICROCARPUM DC.—SEWARD PEN.: south coast, Bluff, No. 1232; Nome, No. 1351. Rare or occasional on dry hillsides.

P. **Walpolei**, n. sp. (TAB. 552, FIG. 4–10). Herba dense caespitosa perennis radice crassa verticali; foliis dense confertis breviter petiolatis, 1.5–4.0 cm. longis, integris vel tri-lobatis tantum, omnino glabris, saturate viridibus et aliquantulum coriaceis; stipulis veteribus longe marcescentibus; scapo 6–16 cm. alto parte inferiori subglabro, superiori submolliter hirsuto, erecto etiam ante anthesi; floribus 2.0 (raro 4.0) cm. diametro, petalis sulfureis vel gilvis, siccatis viridescentibus; capsula 1.5 cm. longa, obovoideo-pyriformi, in stigma latissimum valde attenuata, lobis stigmatis aliquantulum auriculatis; semine 1.0-1.2 mm. longo, lunato, subnitido.

Densely caespitose perennial, with a stout tap root; leaves densely crowded, short-petioled, 1.5 to 4.0 cm. long, the blade entire or merely 3-lobed, entirely glabrous, dark green and somewhat coriaceous; the old stipules long persisting; scape 6 to 16 cm. high, glabrous below, hirsute-strigose above, erect even in pre-anthesis; the flowers 2.0 (rarely 4.0) cm. in diameter, petals pale yellow or creamy white, turning green in drying; capsule 1.5 cm. long obovoid-pyriform strongly tapering from the very broad stigma, stigma-lobes somewhat auricled; seed 1.0 to 1.2 mm. long, crescent-shaped and somewhat shiny.—SEWARD PEN.: Nome, Anvil Hill, gravelly mountain slope and cliffs, August 6–10, 1926, *A. E. & R. T. Porsild*, No. 1352 (TYPE); Bluff, No. 1231; Nome, *B. Miller*, No. 137-C (US); *Thornton*, Nos. 304-A and 404-B (US, T); Port Clarence, *Walpole*, Nos. 1432, 1470 and 1473 (US). Thus far known only from mountains of Seward Peninsula.

Papaver Walpolei is named for *F. A. Walpole*, who, in 1901, appears first to have collected this strikingly distinct species. It appears to be well distinguished from all other boreal or arctic members of the genus by its sub-entire or few-lobed, entirely glabrous, almost coriaceous, dark green leaves. It is marked also by its very distinctive obovoid-pyriform capsule, strongly tapering from the broad stigma.

CORYDALIS PAUCIFLORA (Steph.) Pers.—ALASKA RANGE: Broad Pass, No. 40. Rare or occasional on high mountains of the interior of Alaska and Yukon. Also known from Norton Sound, Seward Pen. and islands in the Bering Sea.

C. SEMPERVIRENS (L.) Pers.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 135. KOKRINES MTS.: divide towards Melozitna R., No. 739. Occasional on gravelly mountain slopes of the interior.

The record in Pullen's list (Seem. l. c.) "from Pt. Barrow to Mackenzie" certainly must be due to confusion of labels.

SUBULARIA AQUATICA L.—ALASKA RANGE: Richardson Highway, between Paxon and Summit, elevation 3000 feet, No. 546-A. SEWARD PEN.: north coast, Buckland R., No. 1576. Rare, or perhaps often overlooked, on muddy, calcareous margins of small ponds and lakes.

Not previously recorded from central or northern Alaska.

COCHLEARIA OFFICINALIS L. s. l.—NORTON SD.: Qiqertariaq, No. 1084. SEWARD PEN.: Port Clarence, No. 1436. DIOMEDE ISL.: Nos. 1700 and 1701. Common along the sea-shores of the Bering Sea region.

As pointed out by Hultén, Fl. Kamtch. **2**: 146–147 (1928), the various attempts to subdivide the circumpolar *C. officinalis* have not produced very satisfactory results. There does seem, however, to be a western and an eastern race. The above belongs to the western race, distinguished by its longer pods.

APHRAGMUS ESCHSCHOLTZIANUS Andrz.—SEWARD PEN.: Sawtooth Mountains, Grand Central Peak, *Thornton*, No. 409 (US, T).

This very rare species, outside of the Aleutian Islands, in Alaska is known but from the above collection, where it was found in one place only.

EUTREMA EDWARDSII R. Br.—ALASKA RANGE: Broad Pass, in open spruce woods, No. 51-A; Mts. between Healy and Moody Creeks, No. 260. NORTON SD.: Pastolik, No. 1002; hills back of Pastolik, No. 911. SEWARD PEN.: Nome, *Flett* (US); Cape Lisburne (68° 50′) No. 1860. Common in not too wet tundra in the Bering Sea region; rare or occasional on high mountains of the interior.

SINAPIS ARVENSE L.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, along roadsides, No. 425 (introduced).

BARBAREA ORTHOCERAS Ledeb.—ALASKA RANGE: Broad Pass, No. 46 (probably introduced). SEWARD PEN.: Nome, *Thornton*, No. 42 (T).

RORIPPA **barbareaefolia** (DC.) n. comb. *Camelina barbareaefolia* DC. Syst. **2**: 517 (1821). *Tetrapoma barbareaefolium* (DC.) Turcz. ex Fisch. & Mey. Ind. Sem. Hort. Petrop. **1**: 39 (1835). *T. Kruhsianum*

Fisch. & Mey. l. c. *T. pyriforme* Seem. Bot. Voy. Herald, 24, t. 2 (1852), illegitimate substitute name for the two earlier ones cited above.—SEWARD PEN.: north coast, Buckland R., No. 1578.

Seemann, l. c., without formally describing his plant under his new name, united *T. barbaraefolium* Turcz. and *T. Kruhsianum* Fisch. & Mey. (*T. Crusianum* Turcz.). His plate shows a perfectly glabrous plant, although in the text he says about the leaves: "like the whole plant, more or less covered with hair."

Our plant is biennial, the stems are simple or somewhat branching above, hispid-pubescent, 30 to 50 cm. high, stem and radical leaves lanceolate, pinnate, sparingly hispid; the siliques are 4-valved and have 4 (sometimes joined) cells and are further distinguished by being dehiscent at the apex; the style is about 0.75 mm. long, stout, with a truncated stigma; the seeds are small, oblong, punctate and very numerous, 0.6 x 0.4 mm.

Seemann, l. c., says that he has reason to believe that "*T. pyriforme*" was brought to St. Michaels by the Russians, but that it has since become "perfectly wild."

Rorippa barbareaefolia, with *Descurainia sophioides* and *Senecio palustris*, is ubiquitous in all mining camps visited by us. So common are these species on fresh mining-dumps that placer miners in that region believe that the seed has been dug up from the mines with frozen "muck." The truth no doubt is that the above species are amongst the pioneers on new soil. *Senecio palustris* is hapaxanthic and the other two are biennials; all produce an abundance of small, light seed suitable for dispersal by wind and for these reasons are able to spread with amazing rapidity. On the other hand these pioneers cannot successfully compete with the weedy type of perennials, such as *Arctagrostis arundinacea*, *Polygonum alpinum* var. *alaskanum* and *Artemisia Tilesii*, which in a few years succeed them. For this reason *Rorippa barbareaefolia* and its associates are in evidence on fresh mining dumps only.

Rorippa barbareaefolia is not uncommon in suitable places in the Norton Sd. and Kotzebue Sd. regions, far from past and present human habitation. While it might perhaps have been introduced at St. Michaels, the species, no doubt, is indigenous to Alaska.

In addition the writer has seen specimens from YUKON R.: between Ramparts and Tanana, Aug. 9, 1932, *L. J. Palmer*, No. 12 (sub *Radicula clavata* (Rydb.) Macoun) (US) and from the YUKON TERRITORY:

Klondike flats, *Macoun*, No. 58.377 and Hunker Cr., idem, No. 58.378 (both Can). The last two sheets were first named *Radicula hispida* but later (by Theo. Holm) changed to *Rorippa Williamsii* Britt. Bull. N. Y. Bot. Gard. **2**: 171 (1901). The writer in 1937 failed to locate the type of *R. Williamsii* in N. Y. Botanical Garden herbarium, described (l. c.) as being but 15 cm. tall and glabrous, with no mention of tetramerous siliques.

R. PALUSTRIS (L.) Bess.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 136 (var. GLABRATA (Lunell) Vict.); same place, No. 137 (var. HISPIDA (Desv.) Rydb.).

CARDAMINE BELLIDIFOLIA L.—ALASKA RANGE: Broad Pass, No. 47; KOKRINES MTS.: divide towards Melozitna R., No. 742; same place, No. 743 (var. LAXA Lge.). NORTON SD.: hills back of Unalaklet, No. 1154. Rare or occasional on moist cliffs throughout the region but in the interior perhaps limited to high mountains.

C. BELLIDIFOLIA L. var. BERINGENSIS A. E. Porsild in Trans. Royal Soc. of Can. ser. 3, sect. 5, **32**: 31 (1938).—DIOMEDE ISL.: No. 1699. Shores and islands of the Bering Sea region. Also known from mountains of central Alaska, STEESE HIGHW.: Eagle Summit, 109 miles n. of Fairbanks, 3880 ft. elevation, *E. Scamman*, No. 781 (G).

C. BLAISDELLII Eastw. in Bot. Gaz. **33**: 146 (1902). *C. digitata* Kjellm. (non Richards.) f. *oxyphylla* Trautv. Vega Exp. **2**: 44 (1883); *C. hyperborea* Schultz, Mon. Card. 550 (1903) saltem quoad pl. As. orient. et Am. occid. extr. See Porsild in Trans. Royal Soc. Can. ser. 3, sect. 5, **32**: 31 (1938).—KOKRINES MTS.: No. 672; divide towards Melozitna R., No. 744. SEWARD PEN.: south coast, Bluff, No. 1243-A; Nome, No. 1354; same place, *Thornton*, No. 309-A (US); Port Clarence *Walpole*, No. 1897 (US). DIOMEDE ISL.: Nos. 1698 and 1699-A. Rare or occasional in moist, springy places.

C. PRATENSIS L.—FAIRBANKS: No. 191. KOKRINES MTS.: No. 673; divide towards Melozitna R., No. 745. NORTON SD.: Pastolik, Nos. 1004 and 1004-A. SEWARD PEN.: Nome, Nos. 1353, 1353-A and 1354-A. Occasional in marshy places.

The above material, except Nos. 191, 673 and 1004, belongs to a form which has the leaf-blade and petiole densely covered with strigose pubescence. The var. *angustifolia* Hook., common elsewhere in the Arctic, was not seen by us in Alaska.

C. PENSYLVANICA Muhl.—SEWARD PEN.: north coast, Buckland R., No. 1577. Sterile leaf-rosettes from a creeping stolon.

C. PURPUREA Cham. & Schlecht.—ALASKA RANGE: Broad Pass, No. 49; Mts. between Healy and Moody Creeks, No. 259. KOKRINES MTS.: *Miller*, No. 1607 (US). NUNIVAK ISL.: *L. J. Palmer*, No. 165 (US). SEWARD PEN.: south coast, Bluff, No. 1243; Nome, *Grace Hill*, No. 63 (US); Port Clarence, *Walpole*, Nos. 1413 and 1941 (US).

The numbers cited from U. S. National Herbarium are labelled *C. Blaisdellii.* In our No. 1243 the siliques are linear, 18 mm. long and 1.8 mm. wide, short-acuminate, with a short and stout style bearing a capitate stigma; the seeds, of which there are but 2 or 3 in each cell, are greenish-brown, 2.0 mm. long and 1.4 mm. wide. Rare or occasional on moist cliffs. In the interior on high mountains only, in the Bering Sea region north to Wainwright Inlet.

C. UMBELLATA Greene, Pitt. **3**: 154 (1897).—ALASKA RANGE: Richardson Highw., Castner Glacier, very rare, on fresh moraines, near the glacier, No. 480. NUNIVAK ISL.: *L. J. Palmer*, No. 191 (US). SEWARD PEN.: Nome, *Thornton*, No. 804 (US, T) and *B. Miller*, No. 209-C.

New to the interior of Alaska.

LESQUERELLA ARCTICA (Wormskj.) Wats. var. PURSHII Wats. in Proc. Am. Acad. (whole ser.) **23**: 254 (1888).—HEAD OF CHITINA R.: *H. M. Laing*, Nos. 91 and 92. SEWARD PEN.: south coast, Bluff, No. 1241; Nome, *Thornton*, No. 308 (T).

Previously recorded from Alaska but once, from Port Clarence (*Kjellm.*).

CAPSELLA BURSA-PASTORIS (L.) Medic.—FAIRBANKS: College, No. 227. TANANA R.: Hot Springs, No. 642. SEWARD PEN.: Nome, *Thornton*, Nos. 33 and 408 (T). Common north to the limit of horticulture.

DRABA AUREA M. Vahl.[1]—ALASKA RANGE: Broad Pass, No. 43; Nenana Valley, Healy, No. 350; Richardson Highw., between Paxon and Summit, No. 545. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 81, 82 and 85–87. Rare or occasional in dry calcareous soil on mountains of the interior.

DR. CRASSIFOLIA Grah.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, No. 544.

Not previously recorded from northern Alaska.

DR. DENSIFOLIA Nutt. in Torr. & Gray, N. Am. Fl. **1**: 104 (1838); Ekman, Sv. Bot. Tidskr. **25**, 4: 486 (1931).—ALASKA RANGE: Broad Pass, on dry, gravelly slope, No. 61; Nenana Valley, Healy, *J. P. Anderson*, No. 1673 (NY). NORTON SD.: hills back of Unalaklet, No. 1155.

This rare, cordilleran *Draba* forms small, dense cushions on dry, gravelly slopes of high mountains. The flowers are pale yellow. New to the flora of Alaska.

[1] The *Drabae* in the writer's collection, except *Dr. hyperborea*, were named by the late Mrs. El. Ekman, Stockholm; the annotations are by the writer.

DR. EXALATA El. Ekman in Sv. Bot. Tidskr. **25**, 4: 489 (1931), pl. 5, fig. 3.—SEWARD PEN.: south coast, Bluff, No. 1233 (TYPE).

Our specimens are in fruit but in field notes the flowers are said to be yellow.

DR. FLADNIZENSIS Wulfen × LACTEA Adams.—ALASKA RANGE: Richardson Highw., Paxon, No. 543; Nenana Valley, Healy, No. 348-A.

The writer is inclined to agree with Fernald, RHODORA, **36**: 286 (1934) that *Dr. fladnizensis* and *Dr. lactea* (*Dr. Wahlenbergii*), at least as far as our region is concerned, cannot be separated.

DR. GLABELLA Pursh. *Dr. daurica* DC. See Fernald in RHODORA, **36**: 333 (1934).—ALASKA RANGE: Broad Pass, No. 44; Richardson Highw., between Summit and Paxon, No. 546; Paxon, No. 577. KOKRINES MTS.: No. 674. SEWARD PEN.: south coast, Bluff, Nos. 1236 and 1237. Common on the Bering Sea coasts, but in the interior in alpine stations only.

Mrs. El. Ekman saw a hybrid (*Dr. daurica* × *aurea*) in Nos. 546 and 577; to the writer there is nothing in these numbers to suggest *Dr. aurea;* they are not typical *Dr. daurica* but resemble *Dr. MacCallae* Rydb., generally treated as a variety of *Dr. glabella.*

DR. HYPERBOREA Desv.; see Porsild, in Trans. Royal Soc. Can. ser. 3, sect. 5, **32**: 32 (1938); for complete synonymy, see Hultén, Fl. Aleut.—DIOMEDE ISL.: No. 1702. Common on moist sea-cliffs.

Thus far not known from the American shores of Bering Strait.

DR. INCERTA Payson in Am. Journ. Bot. **4**: 261 (1917). *Dr. alpina* var. *hebecarpa* sensu Macoun Cat. **1**: 49 (1883) and *Dr. alpina* var. *glacialis* (in part), ibid. p. 50.—HEAD OF CHITINA R.: dry, rocky slopes between 4500 and 4800 ft., *H. M. Laing,* Nos. 79 and 80.

Draba incerta apparently is a characteristic species of the higher peaks of the Canadian Rockies. It is new to the flora of Alaska.

DR. LANCEOLATA Royle. *Dr. stylaris* of auth. See Fernald in RHODORA, **36**: 357 (1934).—ALASKA RANGE: Broad Pass, No. 45 (*Dr. Thomasii* × *cinerea,* according to El. Ekm.); Nenana Valley, Healy, No. 349. YUKON R.: just above delta, No. 835. SEWARD PEN.: south coast, Bluff, No. 1234 and 1235.

Not previously recorded from the Bering Sea region, nor from the interior.

DR. LONGIPES Raup in Contr. Arnold Arb. **6**: 165, pl. 6, fig. 2 (1934). —HEAD OF CHITINA R.: cleft in wall of canyon, alt. 4500 ft., *H. M. Laing,* No. 84.

Draba longipes, previously known only from mountains of northern British Columbia, is common also in mountains west of the Mackenzie

delta and in the Caribou Hills east of the delta. A large series in the writer's collection from here were by the late Mrs. El. Ekman doubtfully referred to *Dr. daurica* (*Dr. glabella* Pursh). Raup (l. c.) suggests that *Dr. longipes* is perhaps nearest related to *Dr. borealis* DC.

Dr. nivalis Liljebl.—Alaska Range: Broad Pass, No. 42; Nenana Valley, Healy, No. 348. Norton Sd.: Qiqertariaq, No. 1055. Rare or occasional in sandy or dry gravelly places.

Dr. pilosa DC.—Alaska Range: Broad Pass, No. 41. Seward Pen.: Nome, Anvil Hill, Nos. 1355 and 1356.

The above numbers clearly belong to the same species, although El. Ekman referred the first to "*Dr. alpina* L. f. ad *Dr. algidam* Adams." The few-headed or simple, much elongated caudices are densely covered by the marcescent leaf-bases. The strongly one-nerved somewhat fleshy leaves are glabrous above with simple or forked hairs on the underside and along the margins. The naked scape is sparingly pubescent; the flowers are large and pale yellow.

Dr. stenoloba Ledeb., Fl. Ross. **1**: 154 (1842).—Alaska Range: Richardson Highw., Castner Glacier, on fresh moraines, No. 483.

The above material matches the original description and, like Ledebour's, the plants are biennial. New to the interior of Alaska.

Smelowskia calycina (Steph.) C. A. Mey. var. integrifolia (Seem.) Rollins. See Rollins in Rhodora, **40**: 294–301 (1938).—Kokrines Mts.: divide towards Melozitna R., on dry gravelly slopes, No. 741; Kokrines Mts., *L. J. Palmer*, Nos. 1566 and 1588 (US). Norton Sd.: hills back of Qiqertariaq, No. 1056. Seward Pen.: south coast, Bluff, Nos. 1240 and 1240-A; Nome, Anvil Hill, No. 1358; *Thornton*, No. 307 (US, T); *B. Miller*, No. 128-C (US); Port Clarence, *Walpole*, Nos. 1444 and 2041 (US). Rare or occasional on volcanic gravels of mountains of western Alaska.

Our No. 741 differs from the remainder of the material cited above by having all leaves entire, narrowly ligulate, 20 to 40 mm. long and 3 to 4 mm. wide, finely clothed with a thin but very dense stellate pubescence. Although Rollins, l. c., has shown that in the morphological characters of flower and fruit the var. *integrifolia* entirely agrees with the species, the writer, in view of its distinct geographical range, thinks it should perhaps be considered of more than varietal rank. The range of the species (var. *typica*) has recently been extended in the Rocky Mts. north to the Arctic Ocean (Porsild ined.).

Descurainia Sophia (L.) Webb.—Alaska Range: Richardson Highw., between Summit and McCarty, No. 423 (introduced).

D. SOPHIOIDES (Fisch.) O. E. Schultz in Engler, Pflanzenr. **4**, 105: 316 (1924).—NORTON SD.: Qiqertariaq, No. 1057. SEWARD PEN.: Nome, *Thornton*, No. 59 (T); north coast, Buckland R., No. 1579; Kiwalik R., No. 1734. Common on freshly exposed soil such as slumping banks, mining-dumps etc. See notes under *Rorippa barbareaefolia*.

ARABIS HIRSUTA (L.) Scop. ? *A. pycnocarpa* Hopkins var. *typica* Hopkins in RHODORA, **39**: 112–113 (1937).—FAIRBANKS: College, sandy soil in open spruce forest, No. 228.

Hopkins (l. c.) points out that the plant which in North America has passed as *Arabis hirsuta* L. differs from *A. hirsuta* of the Old World in some important characters, such as length of the style, relative width of the wing of the seed, etc. The American plant, by Hopkins named *A. pycnocarpa*, according to him is represented by four varieties of which var. *typica* in Canada is said to extend from eastern Quebec to the Yukon Territory.

It appears to the writer that the plant of western Canada and Alaska is intermediate between those of eastern America and Eurasia and that in the seed-character and in the length of style it is inseparable from the latter. More material from Alaska and Yukon is needed, however, before this point may be satisfactorily settled. Our No. 228 from central Alaska is inseparable from material collected in the Wood Buffalo Park, Mackenzie Basin by Hugh M. Raup, Nos. 2492, 2495, 2498 and 2500 (Can).

A. LYRATA L. var. GLABRA (DC.) Hopkins in RHODORA, **39**: 93 (1937).—ALASKA RANGE: Broad Pass, No. 48; Nenana Valley, Healy, No. 347; Richardson Highw., Castner Glacier, No. 482; Paxon, No. 578. Common in the interior in moist, sandy or gravelly places.

Although previously known from Yukon Territory and from the Pacific coast of Alaska the var. *glabra* does not appear to have been recorded from central Alaska.

A. LYRATA L. var. KAMCHATICA Fisch.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 481 (approaching var. *glabra*). YUKON R.: just above delta, No. 837.

A. RETROFRACTA Graham. See Hopkins in RHODORA, **39**: 179–183 (1937).—ALASKA RANGE: Richardson Highw., between Summit and McCarty, Nos. 424 and 424-A. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 93 and 94. On dry calcareous slopes.

The above localities should be added to the distribution given by Hopkins (l. c. and map 30). Although known from northern British Columbia and central Yukon the species does not appear to have been recorded previously from Alaska.

Erysimum cheiranthoides L.—Yukon R.: alluvial banks just above the delta, No. 836.

E. inconspicuum (S. Wats.) McMill.—Head of Chitina R.: *H. M. Laing*, Nos. 95–98.

Not previously recorded from Alaska.

Alyssum americanum Greene, Pitt. **2**: 224 (1892).—Of this very rare plant the writer has seen the following specimens: Endicott Mts.: upper Koyukuk R., Old Man Cr., *Mendenhall*, July 8, 1901 (US, Can). Yukon R.: Coal Cr. near International Boundary, *Fr. Funston*, No. 77 (US, Can). Porcupine: Ramparts, *Fr. Funston*, No. 178 (US).

Parrya nudicaulis (L.) Regel in Bull. Mosc. **34**, 2: 654 (1861). *P. macrocarpa* R. Br. in Parry's 1st. Voy. App. 270 (1824); Hook. Fl. Bor.-Am. **1**: 47, tab. 15 (1840).—Alaska Range: Broad Pass, No. 51. Seward Pen.: south coast, Bluff, No. 1242; Nome, No. 1357.

The above specimens belong to Hooker's var. aspera which differs from the plant of arctic Canada by being more or less glandular-pubescent and by its somewhat shorter siliques, tapering at both ends and containing but two (or one) seeds in each cell (Hook. tab. 15 B). Rare or occasional on moist, alpine slopes.

Braya humilis (C. A. Mey.) Robins., Syn. Fl. N. Am. **1**: 141 (1895). *Sisymbrium humile* C. A. Mey. in Ledeb. Fl. Alt. **3**: 137 (1831); *Torularia humilis* (C. A. Mey.) Schultz in Fedde, Repert. **12**: 390 (1922).—Alaska Range: Richardson Highw., between Summit and McCarty, No. 422. Head of Chitina R.: *H. M. Laing*, Nos. 89 and 90. Seward Pen.: south coast, Bluff, No. 1238; Nome, *Thornton*, No. 306 (US, T). Kobuk R.: *L. J. Palmer*, No. 661 (US). Rare or occasional on alluvial banks.

Br. purpurascens (R. Br.) Bunge.—Seward Pen.: south coast, Bluff, No. 1239; Port Clarence, *Walpole*, No. 1934 (US). Rare or occasional on mountains of Seward Pen.

Drosera rotundifolia L.—Fairbanks: No. 599. Kokrines Mts.: divide towards Melozitna R., No. 786. Seward Pen.: north coast, Buckland R., No. 1615. Occasional, or no doubt perhaps often overlooked, in sphagnum bogs.

Not previously recorded from northwestern Alaska.

Rhodiola integrifolia Raf. in Atl. Journ. **1**: 146 (1832). *Sedum frigidum* Rydb. in Bull. Torr. Bot. Cl. **28**: 282 (1901); *Sedum Rhodiola* auth. non L. quoad pl. Alask.—Alaska Range: Broad Pass, No. 52; Talketna Mts., *J. P. Anderson*. Kokrines Mts.: divide towards Melozitna R., No. 748. Seward Pen.: Nome, *Thornton*, No. 314 (US); Port Clarence, No. 1437.

Hultén, Fl. Aleut. 206, maintains that it does not seem possible to keep *Rhodiola rosea*, *R. integrifolia* and *R. alaskana* apart. While

that may apply to the last two, these seem well enough distinct from *R. rosea* of Europe and eastern N. America, where it is confined to Greenland, Labrador south to cold ravines in N. Y. and Pa. Any *Rhodiola* occurring in arctic America west of the Mackenzie certainly should be referred to *R. integrifolia.* The latter grows in moist, calcareous meadows whereas *R. rosea* is a plant of dry, rocky ledges.

BOYKINIA RICHARDSONII (Hook.) Bray.—ALASKA RANGE: Broad Pass, No. 59; Mts. between Healy and Moody Creeks, No. 263. KOKRINES MTS.: divide towards Melozitna R., No. 750. SEWARD PEN.: Nome, No. 1367; Port Clarence, *Walpole*, No. 1550 (US). Rare or occasional in moist alpine meadows north to Cape Lisburne, east to mountains of Yukon Territory.

SAXIFRAGA BRACTEATA D. Don.—DIOMEDE ISL.: No. 1707.

From N. W. Alaska recorded previously from Kotzebue Sd. only (fide Hultén, Fl. Aleut.).

S. BRONCHIALIS L. ssp. FUNSTONII (Small) Hultén. See his Fl. Kamtch. **3**: 14–17 (1929).—ALASKA RANGE: Nenana Valley, Healy, No. 353. SEWARD PEN.: south coast, Bluff, No. 1252; Port Clarence, *Walpole*, No. 1586 (US); north coast, Buckland R., No. 1582. DIOMEDE ISLAND: No. 1710. Occasional in alpine, gravelly places.

S. CESPITOSA L.—SEWARD PEN.: Port Clarence, *Walpole*, No. 2060.

Not seen by us.

S. CERNUA L.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 492. SEWARD PEN.: south coast, Bluff, No. 1247; Nome, No. 1362; Port Clarence, *Walpole*, No. 1916 (US); north coast, Kiwalik, No. 1470. Common throughout, but in the interior restricted to alpine places.

S. ESCHSCHOLTZII Sternb.—ALASKA RANGE: Broad Pass, Cantwell, *L. J. Palmer*, Nos. 1911 and 1966 (US). SEWARD PEN.: Nome, *Thornton*, No. 421-A (US, T); Port Clarence, *Walpole*, Nos. 1452 and 1533 (US); Cape Prince of Wales, No. 1733. KOTZEBUE SD.: Kiwalina, *L. J. Palmer*, No. 214 (US). Occasional in alpine, gravelly places.

New to the interior of Alaska.

S. FLAGELLARIS Willd.—NORTON SD.: hills back of Pastolik, No. 915; Qiqertariaq, No. 1058. SEWARD PEN.: Nome, No. 1365. Common on dry, gravelly slopes on mountains of north and northwest Alaska.

S. FOLIOLOSA R. Br.—*S. stellaris* L. var. *comosa* Retz.—SEWARD PEN.: Nome, No. 1364; *Thornton*, No. 305 (US, T). DIOMEDE ISL.: No. 1706. Common on islands and shores of Bering Sea; apparently rare of absent in mountains of the interior.

S. HIERACIFOLIA W. & K.—ALASKA RANGE: Broad Pass, No. 54; Richardson Highw., between Summit and McCarty, No. 426. KOK-

RINES MTS.: *L. J. Palmer*, No. 1553 (US). SEWARD PEN.: south coast, Bluff, No. 1246; Nome, No. 1366. Common in dry upland tundra of northwest Alaska; in the interior perhaps limited to high mountains.

S. HIRCULUS L.—ALASKA RANGE: Mts. between Healy and Moody Creeks, No. 261; Nenana Valley, Lignite, No. 305; Healy, No. 354; Richardson Highw., between Summit and McCarty, No. 427. KOKRINES MTS.: divide towards Melozitna R., No. 749. NORTON SD.: Pastolik, Nos. 1000 and 1001 (the last with flowers 3.0 to 3.5 cm. diam.); Unalaklet, No. 1111. SEWARD PEN.: south coast, Bluff, No. 1249; Nome, No. 1361 (a form 4 cm. high with very narrow, deflexed petals); north coast, Buckland R., No. 1583. Perhaps the most common member of the genus in Alaska.

The usual form in northwestern Alaska is the ferrugineous-villous var. ALPINA with large, deep orange-colored flowers; the pale yellow, small-flowered var. PROPINQUA is not uncommon, however, and there are plenty of transitional forms.

S. INTEGRIFOLIA Hook., Fl. Bor.-Am. **1**: 249, tab. 86 (1832).—SEWARD PEN.: north coast, Buckland R., in a wet swale by a brook near summit of Clem Mt., No. 1581.

The above collection matches Hooker's description and plate, except that the scape, which is that of the mature fruiting plant, is now almost glabrous, except for a few remaining glandular hairs. Apparently new to the flora of Alaska.

S. NIVALIS L.—DIOMEDE ISL.: No. 1711.

Not observed by us on the mainland of Alaska. Most, if not all, previous records from Alaska probably refer to *S. reflexa*.

S. NUDICAULIS D. Don.—SEWARD PEN.: Nome, *Flett* (US); Port Clarence, *Walpole*, No. 1724 (US). DIOMEDE ISL.: No. 1709. Rare or occasional on moist cliffs of shores and islands of the Bering Sea.

S. OPPOSITIFOLIA L.—ALASKA RANGE: Mts. between Healy and Moody Creeks, No. 262. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 99–101. KOKRINES MTS.: No. 675. SEWARD PEN.: south coast, Bluff, No. 1250. Common on gravelly mountain slopes of northwest Alaska; in the interior perhaps limited to the high mountains.

S. OPPOSITIFOLIA L. var. SMALLIANA E. & I. *S. pulvinata* Small in Bull. N. Y. Bot. Gard. **2**: 172 (1901). SEWARD PEN.: Bluff, gravelly mountain slopes, No. 1251.

Of the several varieties or forms of *S. oppositifolia* the var. *Smalliana* certainly is one of the most remarkable. It differs from the typical form of the species by having the leaves densely imbricated in 4 rows, like a *Cassiope tetragona*, and by having its flowers on short, naked

peduncles. It was described from mountains of Yukon Territory and has not been reported before from Alaska.

S. PUNCTATA L. sens. lat.—ALASKA RANGE: Broad Pass, No. 55; Nenana Valley, Healy, No. 356; Richardson Highw., between Summit and McCarty, No. 428. SEWARD PEN.: Port Clarence, No. 1438. DIOMEDE ISL.: No. 1704.

As pointed out by Hultén (Fl. Aleut. pp. 213–214) it does not seem possible to segregate in a satisfactory manner the American representatives of *S. punctata* L. The plant most common in our area may be characterized by its short, erect root-stock, green foliage and stem, with leaf-petioles more than twice as long as the blade and with inflorescence in anthesis more or less capitate. The plant of arctic Canada east of the Mackenzie more closely approaches *S. aestivalis*, but differs by its almost black capsules and purplish scapes and leaves, in which characters it approaches ssp. *insularis* Hultén.

S. RADIATA Small in N. Am. Fl. **22**, 2: 128 (1905). *S. exilis* Steph. in Sternb. 1st. Suppl. Rev. Saxifr. 8 (1822), non Pall.—SEWARD PEN.: Nome, *Thornton*, No. 424 (US, T); Port Clarence, *Walpole*, Nos. 1599, 1754 and 1881, (US); Cape Espenberg, *Jas. T. White* (US); north coast of Alaska, Camden B., *Can. Arct. Exp.* Nos. 3 and 111 (sub. *S. cernua*). Moist places in the mountains of northwest Alaska and the Yukon, east along the arctic coast to Mackenzie.

S. REFLEXA Hook., Fl. Bor.-Am. **1**: 249, tab. 85 (1840). *S. radulina* Greene, Pitt. **3**: 308 (1898); *S. yukonensis* Small in N. Am. Fl. **22**, 2: 145 (1905).—ALASKA RANGE: Broad Pass, No. 56; Nenana Valley, Lignite, *J. P. Anderson*. NORTON SD.: Qiqertariaq, No. 1059. SEWARD PEN.: south coast, Bluff, No. 1248. Occasional on gravelly mountain slopes of northwest Alaska, north to Seward Pen.; in the interior on high mountains only.

New to the flora of Alaska. Most, if not all, earlier records of *S. nivalis* from the mainland of Alaska probably belong here.

S. RIVULARIS L.—ALASKA RANGE: Broad Pass, No. 57. SEWARD PEN.: Nome, No. 1363; Port Clarence, No. 1439. DIOMEDE ISL.: No. 1705. Rare or perhaps often overlooked; in moist, sandy places of the Bering Sea shores; in the interior perhaps on high mountains only.

S. SERPYLLIFOLIA Pursh.—ALASKA RANGE: Broad Pass, Cantwell, *L. J. Palmer*, No. 1908. SEWARD PEN.: Nome, *Thornton*, No. 426-A-B (T). WRANGEL ISLAND: *Dr. Ross* (Cruise of Corwin) (US). DIOMEDE ISL.: No. 1708. Rare or occasional on moist, gravelly mountain slopes on islands and shores of Bering Sea, as well as on high mountains in the interior.

New to the flora of central Alaska.

S. SPICATA D. Don. in Trans. Lin. Soc. **13**: 354 (1821). *S. galacifolia* Small in Bull. N. Y. Bot. Gard. **2**: 172 (1901); *Micranthes spicata* (D. Don) Small in N. Am. Fl. **22**, 2: 146 (1905).—YUKON R.: Anvik, *J. W. Chapman*, No. 35 (G); just above delta, No. 838. NORTON SD.: Pastolik, No. 999; hills back of Pastolik, No. 914; St. Michaels, *Bannister* (G, US). SEWARD PEN.: Nome, *Thornton*, No. 803 (US). Rare or occasional in moist herb-mats in mountains of Norton Sd. and Seward Pen.

S. STELLARIS L.—SEWARD PEN.: Port Clarence, *Harriman Exp.* No. 1883 (US).

The writer has seen no other true *S. stellaris* from western North America.

S. TRICUSPIDATA Rottb.—ALASKA RANGE: Broad Pass, No. 53; Nenana Valley, Healy, No. 355. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 102 and 103. Rare or occasional in high mountains of the interior, apparently rare in the Bering Sea region.

S. UNALASCHKENSIS Sternb.—ALASKA RANGE: Broad Pass, Cantwell, *L. J. Palmer*, No. 1945 (sub. *S. Lyallii* (US)). SEWARD PEN.: Port Clarence, *Walpole*, Nos. 1450 and 1477. DIOMEDE ISL.: No. 1709-A.

New to the mainland of northwest Alaska.

CHRYSOSPLENIUM BERINGIANUM Rose.—SEWARD PEN.: Nome, *Thornton*, Nos. 419 and 420 (T). DIOMEDE ISL.: No. 1703. Rare or occasional on moist cliffs of islands and shores of Bering Sea.

C. TETRANDUM Fries.—ALASKA RANGE: Broad Pass, No. 58, with mature seeds on June 8–11; Nenana Valley, Healy, No. 352. KOKRINES MTS.: divide towards Melozitna R., No. 746. SEWARD PEN.: south coast, Bluff, No. 1245; Nome, No. 1360; Port Clarence, *Walpole*, No. 1961 (US); Cape Lisburne, *Washburn* (US). Common in moist, shaded places.

Because of its strong preference for manured soil *C. tetrandum* is commonly found in old abandoned Eskimo dwellings, graves, etc.

PARNASSIA KOTZEBUEI Cham. & Schlecht.—ALASKA RANGE: Broad Pass, No. 60; Nenana Valley, Lignite, No. 304; Richardson Highw., Castner Glacier, No. 491. SEWARD PEN.: Nome, No. 1359; north coast, Buckland R., No. 1580. Common in calcareous soil; in the interior perhaps on high mountains only.

P. PALUSTRIS L.—NORTON SD.: Pastolik, No. 998; Qiqertariaq, No. 1085. SEWARD PEN.: south coast, Bluff, No. 1244. Common in moist, calcareous meadows.

P. PALUSTRIS L. var. NEOGAEA Fernald in RHODORA, **39**: 311 (1937).—FAIRBANKS: in a muskeg, No. 192. ALASKA RANGE: Nenana Valley, Healy, No. 351. KOKRINES MTS.: divide towards Melozitna R., No. 747. HEAD OF CHITINA R.: *H. M. Laing*, No. 230.

Fernald, l. c., has shown that the American representative of *P. palustris* differs from that of Eurasia, chiefly in the shape of the cauline leaf which is deltoid as contrasted to the "round-ovate" one of the Eurasian plant. To the characters given by Fernald for his var. *neogaea* could be added that in the Eurasian plant the hypanthium, sepals and petals and also the immature capsule are densely marked by oblong to linear, rust-colored parallel streaks or spots. Such markings are but rarely seen in American material (outside the Bering Sea region where the typical form of the species occurs). Of 75 sheets of var. *neogaea* examined by the writer but two, from Labrador, showed traces of spots.

Ribes triste Pall.—Alaska Range: Broad Pass, flowering specimens were recorded very rare on June 8. (The single specimen collected was subsequently lost.)

From the Bering Sea region this species has been reported, as *R. rubrum*, on Seward Pen. at Port Clarence by *Rothrock* and from Kotzebue Sd. at Buckland R., by *Seemann*. As far as the writer is aware no one has collected it since.

Spiraea Beauverdiana Schneid. in Bull. Herb. Boiss. **2**, 5: 348 (1905). *S. betulifolia* Am. auth. not Pall.; *S. Stevenii* (Schneid.) Rydb. in N. Am. Fl. **22**, 3: 247 (1908); see also Hultén, Fl. Kamtch. **3**: 38–41 (1929).—Fairbanks: Goldstream Cr. and Pedro Dome, No. 138. Kokrines Mts.: divide towards Melozitna R., No. 751. Seward Pen.: Nome, *Thornton*, No. 45 (T); north coast, Buckland R., No. 1591.

Hultén, l. c., is no doubt correct when he suggests that the var. *Stevenii* is merely an alpine form of *S. Beauverdiana*, not worthy of specific rank. Throughout its American range this small-leaved and much branched low form is found in exposed places; whereas in more favored habitats, particularly where ample snow-cover is assured, *S. Beauverdiana* attains a height of one meter or more, with large-leaved current year's shoots 35 cm. long. In America it seems nearest related to the more southern *S. lucida* Dougl., from which it may always be distinguished by the strongly reflexed sepals. *Spiraea Beauverdiana* is common in muskegs throughout the region, north to Kotzebue Sd.

[S. salicifolia. In Capt. Pullen's list (Seemann, l. c. p. 52) this species is recorded from "Point Barrow to Mackenzie River." The writer very much doubts that any *Spiraea* grows along the north shore of Alaska; at any rate, if so, it would most certainly be *S. Beauverdiana* and not *S. salicifolia*. But Pullen's list on the whole is most unreliable and the above, with some other curious records such as, for example, *Ribes lacustre*, for which the same distribution is given, no doubt is due to confusion of labels.]

[S. PECTINATA (? *Luetkea pectinata*) of Rothrock's list "about Behring's Strait" no doubt is based upon the very dubious record in Hooker, Fl. Bor.-Am. **1**: 254 of a specimen collected and so labelled by Menzies.]

AMELANCHIER FLORIDA Lindl. ? *A. alnifolia* Nutt.—HEAD OF CHITINA R.: a small shrub 50 cm. high, elevation 2000 ft., *H. M. Laing*, No. 121. Not previously recorded from Alaska.

RUBUS ACAULIS Michx.—FAIRBANKS: in a muskeg, No. 195; College, No. 230. Common throughout the interior, on alluvial banks and in cold spruce woods.

R. ARCTICUS L.—KOKRINES MTS.: divide towards Melozitna R., Nos. 754 and 755.

Because of the calyx-lobes, which are pubescent on both sides and somewhat glandular, and because of the short-clawed, obovate petals the above is referred with some doubt to *R. arcticus*, rather than to *R. acaulis*.

R. CHAMAEMORUS L.—ALASKA RANGE: Broad Pass, No. 64. HEAD OF CHITINA R.: *H. M. Laing*, No. 104. KOKRINES MTS.: divide towards Melozitna R., Nos. 752 and 753. SEWARD PEN.: north coast, Buckland R., Nos. 1588 and 1589. DIOMEDE ISL.: No. 1712. Common in not too wet tundra throughout the region. One of the dominant species of low tundra in northwest Alaska.

R. IDAEUS L. var. CANADENSIS Richards.—HEAD OF CHITINA R.: in a burn, alt. 2500 ft., *H. M. Laing*, No. 105.

R. STELLATUS Sm.—SEWARD PEN.: Nome, No. 1368; north coast, Kiwalik R., No. 1471.

The first is typical, with 3-lobed very firm leaves and firm, brown stipules; the calyx-lo' es are glandular-pubescent and strongly deflexed. On Seward Pen. *R. stellatus* is probably sterile; our specimens, on August 10, were just past flowering. No. 1471 did not appear to have flowered that season.

FRAGARIA SP.

At least one species of wild strawberry is very common on alluvial banks along the Yukon R., between Tanana and Holy Cross. Unfortunately specimens collected here were lost.

POTENTILLA BIFLORA Willd.—SEWARD PEN.: south coast, Bluff, No. 1258; Nome, No. 1369; *Thornton*, Nos. 184 and 492 (T). Rare or occasional on alpine slopes of Seward Pen. in *Dryas* heath on gravelly soil.

This is among the latest flowering species, but appears to mature fruit in normal years. The petals are pale yellow. Also known from Sadlerochit R., on the north coast of Alaska (Can. Arct. Exp.). Reported from there by Holm and Macoun (1921) as *Dryas integrifolia*.

P. ELEGANS Cham. & Schlecht.—SEWARD PEN.: Mt. Tumit in the Sawtooth Range, 3068 ft. above sea level, *Thornton*, No. 416 (T).

A small but apparently typical specimen of what appears to be the first and only American collection of this pretty species of northeastern Asia, was found in the Thornton collection. We searched for it unsuccessfully in a number of places.

P. EMARGINATA Pursh.—DIOMEDE ISL.: No. 1713. Appears to be rare on the mainland of Alaska (Cape Vancouver, *J. M. Macoun*, No. 19.919 (Can).)

P. FRUTICOSA L.—FAIRBANKS: No. 232. ALASKA RANGE: Broad Pass, No. 65-A; Richardson Highw., between Paxon and Summit, No. 547. HEAD OF CHITINA R.: *H. M. Laing*, No. 110. KOKRINES MTS.: divide towards Melozitna R., No. 758. SEWARD PEN.: south coast, Bluff, No. 1259. Common throughout the region in muskegs, dry heath and willow thickets north to Kotzebue Sd.; also known from the north coast of Alaska on the Sadlerochit R.

P. GLAUCOPHYLLA Lehm.—ALASKA RANGE: Richardson Highw. between Paxon and Summit, No. 548. Common on moist, grassy mountain slopes.

New to the flora of Alaska.

P. HIPPIANA Lehm.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 429.

New to the flora of Alaska.

P. HOOKERIANA Lehm. Delect. Sem. Hort. Hamb. 10 (1849).—HEAD OF CHITINA R.: very common on dry hillsides, between 2500 and 3000 ft. elev., *H. M. Laing*, Nos. 115–117.

This little known species, previously known only from foothills and plains of Saskatchewan, Alberta and Montana, appears to be fairly common on limestone cliffs and on dry, calcareous slopes throughout the Yukon Territory east to Great Bear Lake, N.W.T. The above numbers with more abundant material in the writer's collection from Northwest Canada matches the description and the beautiful plate in Lehmann, Revisio Potentillarum, tab. 55 (1856). By its firm, stiffly erect flowering stems and by its small flowers in dense, many-flowered cymes *P. Hookeriana* seems well separated from all forms of the polymorphous *P. nivea*.

P. NORVEGICA L.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 139. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 430. HEAD OF CHITINA R: *H. M. Laing*, No. 111. TANANA R.: Hot Springs, No. 643. Common in the interior, in alluvial soil and in wet meadows.

P. PACIFICA Howell.—YUKON R.: Birches, No. 607; Kokrines, No.

625. Norton Sd.: Qiqertariaq, No. 1060. Abundant on banks of the Yukon and Tanana rivers.

P. palustris (L.) Scop.—Fairbanks: Smith Lake, No. 597. Kokrines Mts.: divide towards Melozitna R., No 759. Head of Chitina R.: *H. M. Laing*, No. 109. Yukon Delta: Kotlik, No. 872. Seward Pen.: Nome, *Thornton*, Nos. 32 and 480 (T); north coast, Kiwalik R., No. 1472; Buckland R., No. 1590. Common in wet, swampy places throughout the region.

P. pensylvanica L. ?*P. virgulata* Nelson, saltem quoad pl. Alaska. —Seward Pen.: Port Clarence, No. 1449-A. Rare or occasional in sandy places, often on stabilized dunes near the sea-shore east to the Mackenzie delta.

P. uniflora Ledeb. in Mém. Acad. St. Petersb. **5**: 543 (1812). *P. villosa* Pall. var. *uniflora* Ledeb., Fl. Ross. **2**: 58 (1844); *P. subquinata* var. *Pedersenii* Rydb. in Bull. Torr. Bot. Cl. **28**: 182 (1901) in part; *P. Pedersenii* Rydb. in N. Am. Fl. **22**, 4: 332 (1908) in part.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 140-A. Alaska Range: Broad Pass, No. 65; Mountains between Healy and Moody Creeks, No. 264; same place, but larger-flowered, No. 264-A. Head of Chitina R.: *H. M. Laing*, No. 112. Norton Sd.: hills back of Pastolik, No. 916. Seward Pen.: south coast, Bluff, No. 1255; same place (second flowering) No. 1257; Nome, Anvil Hill, No. 1370.

After much time spent trying to divide in a satisfactory manner the very copious material in his own collection from Bering Strait to Hudson Bay, the writer, at least for the time being, has thought it best to treat *P. uniflora* as a polymorphous species having a phylogenetic affinity in the east to *P. Vahliana* and in the west to *P. villosa*.

The following three numbers perhaps are nearest related to *P. uniflora* but in some respects, particularly by the very prominent venation of the underside of the leaves, more than the rest approach *P. villosa*.—Norton Sd.: hills back of Pastolik, No. 917. Seward Pen.: south coast, Bluff, on bird cliffs, No. 1256; north coast, Buckland R., Clem Mt. No. 1586. *P. uniflora* appears to be common on alpine, gravelly slopes throughout the region, east through the mountains of Yukon Territory at least to the Mackenzie R.

P. villosa Pall. *P. fragiformis* var. *villosa* of auth.—Yukon R.: on alluvial banks, just above delta, No. 839.

P. villosa is a plant of the Pacific coast and barely enters our region. Seemann's report from Kotzebue Sd. certainly needs verification.

Sibbaldia procumbens. L.—Alaska Range: Richardson Highw., between Paxon and Summit, No. 549. Rare or occasional on high mountains of the interior; common on islands of Bering Sea but rare or absent from the mainland of northwest Alaska.

Not previously recorded from the interior of Alaska.

GEUM GLACIALE Adams.—SEWARD PEN.: Nome, *Thornton*, No. 417 (T); Anvil Hill (field notes); Cape Prince of Wales, near the summit at 2300 ft. elevation, October 5, 1926. Rare or occasional on gravelly mountain slopes of the Bering Sea region, north to Cape Lisburne.

G. ROSSII (R. Br.) Sér.—SEWARD PEN.: Nome, Anvil Hill, No. 1371; Nome, *Thornton*, Nos. 174 and 384 (T).

Our specimens are from 25 to 35 cm. high, with flowers and immature fruit on August 6–10.

G. SP.

A tall *Geum* was seen from the railroad train in a muskeg between Fairbanks and Nenana. It most likely was *G. macrophyllum* Willd. var. *perincisum* (Rydb.) Raup, known from S. and S. E. Alaska, Yukon Territory and N. W. Mackenzie.

SANGUISORBA OFFICINALIS L.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, sandy slopes and riverbanks, No. 431. YUKON R.: between Ramparts and Tanana, *L. J. Palmer*, No. 45. SEWARD PEN.: south coast, Bluff, No. 1253; north coast, Buckland R., in wet meadows by a lake, No. 1587.

Hultén, Fl. Kamtch. **3**: 84 (1929), maintains that the American plant which Rydberg (N. Am. Fl. **22**, 4: 387 (1908)) treated under *S. microcephala* Presl cannot be separated from the Eurasian *S. officinalis*. This view undoubtedly is correct, as least with regard to the plant of Alaska and Yukon Territory. *S. canadensis*, reported from Kotzebue Sd., Buckland R., by Seemann probably belongs here.

S. SITCHENSIS C. A. Mey.—ALASKA RANGE: Richardson Highw., moist, alpine slopes near Castner Glacier, No. 494-A; moist places by a brook near Paxon, No. 579.

In Alaska *S. sitchensis*, with *Geranium erianthum*, *Heracleum lanatum*, *Swertia* and others, belongs to the flora of the moist Pacific slope and in the Alaska Range does not cross the divide.

DRYAS DRUMMONDII Richards.—ALASKA RANGE: Richardson Highw., gravel bars in a stream near Castner Glacier, No. 494. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 118 and 119.

Not previously recorded from north of S. E. Alaska.

DR. INTEGRIFOLIA M. Vahl.—ALASKA RANGE: Broad Pass, common locally on dry mountain slopes, No. 63. HEAD OF CHITINA R.: *H. M. Laing*, No. 120. Rare or occasional on high mountains of the interior. Thus far not known from the Bering Sea region.

DR. INTEGRIFOLIA M. Vahl var. SYLVATICA Hultén in Sv. Bot.

Tidskr. **30**, 3: 527, fig. 2a (1936).—Alaska Range: Nenana Valley, on gravel bars in a river flat near Lignite, No. 306.

The var. *sylvatica*, although strikingly different in its extreme form, may perhaps prove nothing more than an ecological form. It is not uncommon throughout the Yukon and N. W. Mackenzie, in shaded places in the lowland, where, as a rule, numerous transitional forms may be seen. A parallel form is found in *Dr. octopetala*. Hultén, l. c., in the diagnosis describes var. *sylvatica* as having scapes 20 mm. high. This is evidently a typographical error for in the figure, said to be half natural size, the scape measures 7.5 cm.

Dr. octopetala L.—Alaska Range: Nenana Valley, dry, gravelly mountain slopes near Healy (near var. argentea Blytt), No. 357; Richardson Highw., Castner Glacier, No. 493 (a peculiar form with quite flat, almost pinnately lobed leaves 3 cm. long). Kokrines Mts.: divide towards Melozitna R., No. 756 (var. argentea). Norton Sd.: hills back of Qiqertariaq, No. 1061 (var. argentea). Seward Pen.: south coast, Bluff, No. 1254; Nome, *Thornton*, Nos. 14 and 390 (T); north coast, Buckland R., Clem Mt., No. 1585.

Fairly common in gravelly places throughout the region, but in the interior limited to high mountains. The var. *argentea* Blytt, with leaves tomentose on both sides, is generally found on calcareous rock. *Dr. octopetala* sometimes flowers a second time late in the season. When this happens no elongation of the scapes takes place and the flowers are hidden among the leaves (No. 1061).

Rosa acicularis Lindl.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 140; in a muskeg, east of the town, No. 194; College, No. 231. Head of Chitina R.: *H. M. Laing*, Nos. 106–108. Kokrines Mts.: divide towards Melozitna R., No. 757. Norton Sd.: hills back of Unalaklet, No. 1156. Seward Pen.: Port Clarence, Teller, *Thornton*, No. 415 (T); north coast, Buckland R., No. 1584.

Common throughout the region, north to Kotzebue Sd. The material is remarkably uniform throughout. The plant reported by Seemann from Kotzebue Sd., Buckland R., as *R. blanda*, no doubt belongs here.

Lupinus arcticus Wats. in Proc. Am. Acad. Arts & Sci. **8**: 526 (1873). *L. perennis* Hook., Fl. Bor.-Am. **1**: 163 (1840) not DC.; *L. nootkatensis* var. *Kjellmanii* Ostf., Gjöa Exp. 52 (1909); *L. yukonensis* Greene, Leaflets **2**: 233 (1912).—Fairbanks: Goldstream Cr. and Pedro Dome, No. 141. Alaska Range: Broad Pass, No. 69; Richardson Highw., between Paxon and Summit No. 550. Head of Chitina R.: *H. M. Laing*, Nos. 122, 125, 126, 128 and 233. Kokrines Mts.: divide towards Melozitna R., No. 763. Seward Pen.: north coast,

Kiwalik R., No. 1473. Common throughout the region on dry, alpine slopes and tundra, north to the arctic coast.

Although Ostenfeld, l. c., maintains that his *L. nootkatensis* var. *Kjellmanii* has no relation to *L. arcticus* Wats., the writer is quite unable to see any real difference when a long series of specimens is examined, or when the species is studied throughout the season in the field. In the type collection of *L. nootkatensis* var. *Kjellmanii*, King Pt. June-July, *Godfred Hansen* (C, Can) the stem and leaf-petioles are thinly covered by long, yellow, villous hairs, but studies in the field or examination of a larger series than Ostenfeld had at his disposal shows that these hairs are caducous. On the whole the Alaska-Yukon material of *L. arcticus* is more hirsute than that of arctic Canada, which perhaps may show relationship to *L. nootkatensis*, but none of it has the obtuse rounded apices of the leaflets so characteristic of that species.

TRIFOLIUM HYBRIDUM L.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 432. YUKON R.: Kokrines, No. 627. In both places introduced.

ASTRAGALUS ALPINUS L.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 496. HEAD OF CHITINA R.: *H. M. Laing*, No. 129. NORTON SD.: Pastolik, No. 1005. KOKRINES MTS.: No. 676. SEWARD PEN.: south coast, Bluff, No. 1260; Port Clarence, No. 1440; north coast, Buckland R., No. 1593-A. Common in dry tundra at the coast and on alpine, sandy slopes in the interior, north to the arctic coast.

A. FRIGIDUS (L.) Bunge var. LITTORALIS (Hook.) Wats., Bibl. Ind. 193 (1878); Ostf., Gjöa Exp. 54 (1909). *Phaca frigida* var. *littoralis* Hook., Fl. Bor.-Am. **1**: 140.—ALASKA RANGE: Broad Pass, No. 66; Nenana Valley, Healy, No. 358; Richardson Highw., between Summit and Paxon, No. 580. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 127 and 128.

Hooker, l. c., by "calycibus leguminibusque nigro-hirsutis, caule humiliore, foliolis subtus pubescenti-incanis" well describes the plant from arctic N. W. America which extends from the arctic coast west of Mackenzie through the high mountains of Yukon and Alaska, reaching south almost to the 60th parallel, and which no doubt is the same as var. *parviflora* Ledeb., Fl. Ross. **1**: 576.

A. **linearis** (Rydb.), n. comb. *Atelophragma lineare* Rydb. in Bull. Torr. Bot. Cl. **40**: 50 (1913).—NORTON SD.: volcanic hills back of Pastolik, No. 918.

Our specimens match the description as well as material in the

National Herbarium of Canada determined by Rydberg. *A. lincaris* is clearly separated from *A. aboriginum* by the fresh green color of the leaves, by the leaflets being glabrous above, narrow and revolute; also the pods are purplish brown and more turgid than in the latter species. New to the flora of Alaska.

A. POLARIS Benth. apud Hook., in Trans. Linn. Soc. **23**: 323 (1861). *Phaca polaris* (Benth.) Rydb. in N. Am. Fl. **24**, 6: 349.

Of this striking species thus far known only from the type locality (Eschscholtz B. in Kotzebue Sd.) there is an apparently unpublished record in the National Herbarium of Canada, from Cape Vancouver, south of the Yukon Delta, *J. M. Macoun*, No. 19.543. We looked for *A. polaris* everywhere but failed to discover it.

OXYTROPIS FOLIOLOSA Hook., Fl. Bor.-Am. **1**: 146 (1840).—HEAD OF CHITINA R.: *H. M. Laing*, Nos. 131 and 132.

New to the flora of Alaska.

O. HUDSONICA (Greene) Fern. See RHODORA, **30**: 142, pl. 172 (1928).—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 495. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 136 and 137.

New to the flora of Alaska.

O. **kokrinensis**, n. sp. (TAB. 553). Herba subcaulescens e radice crassa verticali; caudicibus longis stipulis ferrugineis longe persistentibus petiolis adnatis, dense tectis; parte libera stipulae prominenter uninervia longe deltoidea acuta, juventute sericeo-villosa, aetate tantum ciliata et deinde quasi glabrata; foliis longe petiolatis 3–5 cm. longis impari-pinnatis, foliolis 3–4-jugis margine revolutis longe sericeo-villosis; scapis folia vix superantibus; inflorescentia plerumque biflora bracteis scariosis, pedicellis valde brevioribus; calyce violaceo villoso, dentibus subulatis quam tubo dimidio minor; corolla purpurea, 1.0–1.5 cm. longa; legumine recto intra calycem stipitato 2.0–2.5 cm. longo 0.6–0.8 cm. lato, pubescentia adpressa brevi nigrocanescente cooperto.

Sub-caulescent from strong many-headed tap-root, the long caudices densely covered by long persisting, ferrugineous stipules with attached petioles; free part of the stipule strongly nerved, long-triangular, acute, when young silky-villous, in age merely ciliate and at length almost glabrous; leaves long-petioled 3–5 cm. long with 3–4 pairs of revolute leaflets, long silky-villous; scapes barely exceeding the leaves; inflorescence mostly two-flowered, with scarious bracts much shorter than the pedicels; calyx purplish-brown, villous, the teeth subulate, half as long as the tube; corolla purple, 1.0 to 1.5 cm. long; legume straight, stipitate within the calyx, 2.0 to 2.5 cm. long, 0.6 to 0.8 cm. wide, with a short grayish-black, appressed pubescence.—KOKRINES MTS.: divide towards Melozitna R., June 23 to July 5, 1926, elevation

2000 to 4000′, *A. E. and R. T. Porsild*, No. 762 (TYPE); same place No. 761.

Oxytropis kokrinensis is probably closely related to *O. rubricaudex* Hultén, Fl. Kamtch. **3**: 110, fig. 14a–b, tab. 2 fig. e–f (1929) but differs in being 2-flowered and by having non-glandular stipules. From *O. revoluta* Lædeb. it differs in having the free part of the stipules acute and from *O. nigrescens* and *O. pygmaea* by its very conspicuous, dark-ferrugineous stipules and the long-marcescent leaf-petioles 1–2 cm. long. *O. kokrinensis* flowers very early; in the type number there are mature pods and flowers just opened in the same plant.

O. MAYDELLIANA Trautv. *O. campestris* var. *melanocarpa* Hook.—KOKRINES MTS.: divide towards Melozitna R., No. 760. SEWARD PEN.: south coast, Bluff, No. 1262; Nome, *Thornton*, No. 186 (T). Rare or occasional on high mountains, north to the arctic coast.

O. MERTENSIANA Turcz.; Eastwood in Bot. Gaz. **33**: 206 (1902).—SEWARD PEN.: Nome, Anvil Hill, No. 1372; *Thornton*, No. 321 (T); Cape Nome, 1900, *Blaisdell* (NY).

This eastern Asiatic species thus far has been found nowhere else in America. A plant reported by *Seemann* (l. c. p. 28) from Cape Lisburne as *O. arctica* was referred with some doubt by Asa Gray in Proc. Am. Acad. n. s. **12**: 7 (1884) to *O. Mertensiana*. Eastwood's record presumably is correct, although the description given, "leaves 3–5 or solitary etc.," is somewhat ambiguous.

O. NIGRESCENS (Pall.) Fisch. See Fernald in RHODORA, **30**: 153 (1928).

Fernald, l. c., has shown that the plant of arctic and alpine parts of northwest America which generally has passed for *O. nigrescens* should really be called *O. pygmaea*. This view, undoubtedly, is correct on the whole, but there are specimens from the Bering Sea region of true *O. nigrescens* that well match Pallas' description. *O. nigrescens* is loosely caespitose, with long, forking caudices, densely covered by old, pale gray stipules with persisting leaf petioles. The stipules and their acuminate free part are black-villous. Typical specimens of *O. nigrescens* are: HALL ISL.: *J. M. Macoun*, No. 19.545; *Harriman Exp.* No. 2014; ST. MATHEW ISL.: *J. M. Macoun*, No. 18.510 (all Can).

O. PODOCARPA Gray.—ALASKA RANGE: Broad Pass, high alpine slope, No. 67; Mountains between Healy and Moody Creeks, 4000 feet, No. 265-A. HEAD OF CHITINA R.: *H. M. Laing*, No. 130.

Oxytropis podocarpa, in the west, appears to be a species of high mountains of the Cordilleran system, in central Alaska and Yukon

reaching north to the Arctic Circle, but which has not yet been found on the arctic coast. In anthesis it is sometimes hard to distinguish from *O. pygmaea*. The flowers as a rule are smaller and the plant is more densely pulvinate. In fruit the huge, strongly inflated pods 2–3 cm. long, strongly stipitate within the calyx, cannot be mistaken for anything else.

O. PYGMAEA (Pall.) Fern. in RHODORA, **30**: 153 (1928). *O. nigrescens* of most Am. auth. not Pall.—ALASKA RANGE: mountains between Healy and Moody Creeks, semi-barren mountain peak, 4000 feet, No. 265. SEWARD PEN.: Nome, Sawtooth Mts., *Thornton*, No. 324 (NY, T). Rare or occasional in alpine or arctic parts of Yukon-Alaska, north to the arctic coast and east to Mackenzie R.

O. RETRORSA Fern. in RHODORA, **30**: 140 (1928).—MATANUSKA VALLEY: *J. P. Anderson*, No. 1789 (NY).

New to the flora of Alaska.

HEDYSARUM ALPINUM L.—SEWARD PEN.: south coast, Bluff, No. 1261; north coast, Buckland R., No. 1592. Common on the Bering Sea coasts and the north coast of Alaska, east to the Mackenzie.

H. ALPINUM L. var. AMERICANUM Michx. *H. boreale* Nutt.—ALASKA RANGE: Broad Pass, No. 68; Richardson Highw., Castner Glacier, No. 497. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 138 and 139. KOKRINES MTS.: river flats, No. 677. Common in sandy, alluvial soils.

The tuber-like processes of the strong rhizomes are edible and form an important food item of the aborigines of Alaska.

The variety in the western arctic, west of Mackenzie, imperceptibly merges into the species from which it differs chiefly by its more robust growth, its long raceme and drooping flowers.

H. MACKENZII Richards.—ALASKA RANGE: Nenana Valley, Lignite, No. 307. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 140, 231 and 141 (the last is var. ALBIFLORUM). Occasional throughout the mountains of Yukon-Alaska.

The only previous record from Alaska (Rothrock, l. c. 445), from the upper Yukon R., is open to question because it is called a "Sweet-ish root, eaten by Indians," which clearly shows that reference was made to the edible root of *H. alpinum* var. *americanum*.

LATHYRUS JAPONICUS Willd. See Fernald in RHODORA, **34**: 177 (1932). *L. maritimus* Big.—NORTON SD.: Qiqertariaq, No. 1086 (var. ALEUTICUS). Common on sandy beaches of Norton Sd.

L. PALUSTRIS L. var. PILOSUS (Cham.) Ledeb.—YUKON R.: Birches, No. 608; Kokrines, No. 626. Common in willow thickets along the Yukon on alluvial soil.

Geranium erianthum DC.—Alaska Range: Richardson Highw., between Paxon and Summit, No. 563. Head of Chitina R.: *H. M. Laing*, No. 142. Moist, alpine meadows of the south slope of Alaska Range.

New to the flora of the interior.

Linum Lewisii Pursh.—Head of Chitina R.: *H. M. Laing*, No. 143. Previously (under *L. perenne*) recorded from Ft. Yukon (*Rothr.*).

Callitriche hermaphroditica L. *C. autumnalis* L. For discussion see Fernald in Rhodora, **25**: 211 (1923).—Seward Pen.: north coast, Buckland R., No. 1598. Common in tundra lakes of the Bering Sea region.

New to the flora of Alaska.

C. verna L. emend. Lönnroth, Obs. Crit. 17 (1854). *C. palustris* L. of Am. auth.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 142. Alaska Range: Nenana Valley, Lignite, No. 308. Yukon Delta: Kotlik, No. 874 (f. caespitosa). Norton Sd.: Pastolik, No. 1010 (f. caespitosa). Seward Pen.: Port Clarence, No. 1441; north coast, Buckland R., Nos. 1595–1597. Apparently common in shallow ponds throughout the region.

Known previously from the Aleutians and the south coast.

Empetrum nigrum L.—Head of Chitina R.: *H. M. Laing*, No. 144. Seward Pen.: Nome, *Thornton*, No. 483 (T). Diomede Isl.: No. 1714. Common throughout the region but in the interior sometimes absent in the lowland.

Impatiens biflora Walt.—Tanana R.: Hot Springs, No. 655.

New to the flora of Alaska.

(To be continued)

ON THE STATUS OF ELEOCHARIS ROBBINSII IN NEW YORK

Robert T. Clausen

House (1924) reported *Eleocharis Robbinsii* Oakes in New York from Dutchess County and Long Island, also as rare in the northern and central parts of the state, whence he listed it only from Essex and Oswego Counties. Although Svenson (1929 & 1939) stated the range as extending westward through central New York to Michigan and northward to the Timagami Forest Reserve, Ontario, he cited only one collection from southern New York, but on his map indicated two collections from the central part, one from the northern section,

and several from the southern part. On the basis of this evidence, one might conclude that the species is rare and local north of Dutchess County, but data at hand do not support this conclusion.

In the field, the writer was introduced to *E. Robbinsii* by Mr. J. L. Edwards at Hopkins Corners, 3½ miles north-northeast of Lafayette, Sussex Co., New Jersey (*Clausen & Edwards 3530*). There the species was growing abundantly in water 2 feet deep in a pond-like marsh in a limestone depression. Impressed by the superficial resemblance of this *Eleocharis* to *Scirpus subterminalis*, the writer searched through the herbarium at Cornell University to determine whether there were any sheets of *E. Robbinsii* from central or northern New York from stations additional to those already reported. In the cover designated for *Eleocharis Robbinsii* there was only one such sheet, the collection of *G. T. Hastings*, August 1, 1898, from Tully Lake. In the cover for *Scirpus subterminalis* Torrey a surprise awaited me. There were six collections of *E. Robbinsii* from an equal number of counties: Franklin, Fulton, Hamilton, Onondaga, Putman, and St. Lawrence. Although some of the specimens were sterile, others had spikes, but these were mostly poorly developed or depauperate, hence the errors in identification.

Characters ordinarily employed for distinguishing flowering and fruiting specimens of *Eleocharis* and *Scirpus*, can not be used for sterile material. To separate sterile herbarium specimens of *E. Robbinsii* from *S. subterminalis*, the following key may prove helpful.

A. Culms prominently and coarsely longitudinally ribbed, ribs 4–8 across the flattened culm, varying in size and irregularly spaced; stomata conspicuous, in prominent linear series; culms 1–2 mm. wide when pressed; capillary leaves or abortive culms occasionally present. . . . . *Eleocharis Robbinsii.*

AA. Culms obscurely and finely longitudinally ribbed, with the ribs 6–12 across the flattened culm, these equal in size and regularly spaced; stomata inconspicuous, not in prominent linear series; culms 0.6–0.8 (–1.0) mm. wide when pressed; capillary submerged leaves commonly present *Scirpus subterminalis.*

The culms of *Eleocharis Robbinsii* are usually rigidly erect in the field, with the spikes well out of the water; while the culms of *Scirpus subterminalis* tend to trail, with the spikes scarcely out of the water.

As a result of the study of specimens in the herbarium of Cornell University (Corn) and at the New York Botanical Garden (NY), the writer considers *Eleocharis Robbinsii* to be rather widely distributed and not rare in central and northern New York. No specimens were

studied from west of Onondaga County. Citations are made for all counties from which material has been seen.

New York. Dutchess Co.: Pine Plains, *T. C. Porter* (NY). Essex Co.: reported by House (1924). Franklin Co.: Fish Creek, Upper Saranac Lake, *W. C. Muenscher, W. E. Manning*, and *B. Maguire 294* (Corn). Fulton Co.: outlet of East Caroga Lake, *W. C. Muenscher* & *R. T. Clausen 4421* (Corn) Hamilton Co.: shallow water, south end of Long Lake, *W. C. M.* & *R. T. C. 3843* (Corn). Onondaga Co.: shallow water, Big Tully Lake, *W. C. M.* & *O. F. Curtis, Jr. 5004* (Corn). Putnam Co.: south end of Pine Pond (Gyspy Lake), *W. C. M.* & *O. F. C., Jr. 5686* (Corn). St. Lawrence Co.: Massawepie Lake, *W. C. M.* and *Bassett Maguire 1027* (Corn). Suffolk Co: Calverton, *Roy Latham 4565* (Corn); also 11 other collections.

Bailey Hortorium, Cornell University
Ithaca, New York

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House, Homer D. 1924. *Eleocharis Robbinsii*, in Annotated list of the ferns and flowering plants of New York State. N. Y. State Mus. Bull. No. 254: p. 136.

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———. 1939. *Eleocharis Robbinsii*, in Monographic studies in the genus *Eleocharis*—V. Rhodora **41:** 11. Map 3.

Erechtites megalocarpa on Long Island.—The unusually fleshy and rugose plant with achenes 4–5 mm. long, found locally on the sandy borders of salt marshes of southern Cape Cod, now appears in similar spots on Long Island. At Islip, Suffolk County, it is found in sandy saline flats accompanied by *Spartina*, *Salicornia*, and *Pluchea camphorata* (*Svenson* no. 6855).—H. K. Svenson, Brooklyn Botanic Garden.

Volume 41, no. 485, including pages 141–192, was issued 3 May, 1939.

MELANDRIUM MACROSPERMUM, n. sp.: FIGS. 1 and 2, fruiting plants, × 2/5; FIG. 3, dehiscent capsule, × 5/3; all from TYPE (Norton Sound, Alaska).

PAPAVER WALPOLEI, n. sp.: FIG. 4, plant in pre-anthesis, × 2/5; FIGS. 5, 6 and 7, flowering plants, × 2/5; FIG. 8, fruiting plant, × 2/5; FIG. 9, basal leaf, × 5/3; FIG. 10, capsule, nearly mature, × 5/3; all from TYPE (Seward Peninsula, Alaska).

OXYTROPIS KOKRINENSIS, n. sp.: FIG. 1, flowering plant, × ⅔; FIG. 2, fruiting plant, × ⅖; FIG. 3, caudex covered by long-persisting stipules with attached petioles, × 5/3; FIGS. 4, flower, 5, calyx, and 6, legume, × 5 3; all from TYPE (Kokrines Mountains, Alaska).

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THE EELGRASS SITUATION ON THE AMERICAN PACIFIC COAST

Clarence Cottam

Since the abrupt and unprecedented diminution of eelgrass on the Atlantic coast, numerous requests for information on the condition of eelgrass on the Pacific coast have been received. During the past few months printed reports have given evidence of a scarcity of this important submerged aquatic waterfowl food plant at a number of west coast bays. It was reported that this food scarcity was causing birds that normally remain in salt water to come inland to feed. Incidentally this has been a common occurrence along the east coast since the onset of the eelgrass scarcity. Until recently many have held that a Mycetozoan (*Labyrinthula*) was the organism responsible for the widespread wasting disease of the east coast eelgrass. Because ships commonly carry water as ballast, and because shellfish are frequently transplanted from the east to the west coast, it has been feared that the causative organism, if such existed, might inadvertently be introduced into these waters. Consequently with this feeling that there was a distinct possibility of the "wasting disease" developing on the west coast, it was felt that the recent reports of the Pacific eelgrass scarcity might be well founded; therefore, it was deemed advisable to obtain reliable information on the true status of the plant.

On July 21, in company with Mr. James Moffitt, of the California Academy of Sciences, the writer made an inspection of eelgrass conditions at Tomales Bay, Marin County, California. Many "slicks" were noted where the "grass" came to the surface of the water and

made it impossible for a motorboat to travel through it. Careful inspection was made of rhizomes of the plant as well as of those parts occurring above the surface of the mud. No characteristic spotting or streaking was noted on the underground parts or leaf blades, as is so common with the diseased eastern coast plants.

During the first week of July, Mr. T. H. Scheffer, retired associate biologist of the Biological Survey, made an inspection of conditions at Grays Harbor and Willapa Harbor, Washington, and reported that he could find no evidence that any disease has been or is affecting the eelgrass. From contact with a number of experienced and reliable oystermen who are constantly working along the coast he obtained complete confirmation of his findings. He writes further: "Everywhere along the coast reports of observers, whether scientifically inclined or not, indicate that there were unusually large flights of brant and geese the past spring, and that many flocks remained for extended periods. Naturally these waterfowl gathered in such numbers on the tide-land meadows as to attract attention, particularly at times when the eelgrass beds were less accessible on account of the higher tides. A case in point was the gathering of large flocks of brant on tide-land meadows that could be observed from the office of the South Bend Journal, where the report, of which you received a clipping, originated."

Reports of conditions along the coast of British Columbia have recently been received from Mr. J. A. Munro, Chief Federal Migratory Bird Officer, B. C., Dr. W. A. Clemens, Director, Pacific Biological Station, Nanaimo, B. C., and Dr. Irene Mounce, Assistant Plant Pathologist, Division of Botany, Department of Agriculture, B. C., Canada. Mr. Munro states that he "observed no reduction of eelgrass this spring while on Vancouver Island and found black brant in large numbers on their usual feeding grounds." Dr. Clemens writes as follows:

> "Although *Labyrinthula* has been identified from the eelgrass in Departure Bay, there is no evidence of a decrease in the amount of growth on the eelgrass beds at the present time. Furthermore last fall I requested the Department of Fisheries to ask the fishery inspectors along the coast to report on the grass beds of their respective districts and no reports indicated a lessened amount. We are watching the situation and so far there is no sign of an epidemic in the eelgrass beds along the Canadian coast."

Dr. Mounce writes under date of September 9, 1938 that she has recently made personal observation only at Royston, Vancouver Island, B. C., and concluded that "There seemed to be no noticeable change in the amount of grass" and that the people living along this coast concurred with this view. She added further that the amount present was "certainly as much as I remember some years ago." In September 1937 she also informed us that their department had no reports indicating "any decrease" in eelgrass at Departure Bay.

From Alaska, Regional Director Frank Dufresne indicates that eelgrass conditions are normal. His warden, Jack Benson, reports that eelgrass was noted in December 1937 (and apparently was in healthy condition) at Nelson Lagoon adjacent to Bering Sea. At a later date at Morjhovoi, Cold and Pavlof Bays, Alaska Peninsula, he found waterfowl and their food in abundance and adds that "an abundance of eelgrass was noted in many places along the Alaskan Peninsula."

We have no authentic data indicating any disease or reduction of eelgrass along the Pacific coast.

Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer of Ontario and Quebec, wrote under date of September 9, 1938 that he has observed no noticeable change in the scarcity of eelgrass along the north shore of the Gulf of St. Lawrence.

Concerning the condition on the English coast, Dr. A. D. Cotton of the Herbarium, Royal Botanic Garden, Kew, Surrey, England, informed us on August 26, 1938 that he "believed the situation is somewhat easier" than it has been in recent years.

Dr. F. Borgesen of the University Botanical Museum, København, Denmark, on September 5 of this year wrote that along their coast the eelgrass seems to be slowly recovering. He reports that at a number of localities he has found apparently healthy plants. At Hellebock (north of Elsinore) after a prolonged wind, he has for the first time since the outbreak of the disease, found a good deal of eelgrass drift.

Since our April summary of the eelgrass situation along the Atlantic coast (published as Leaflet BS–110, Status of Eelgrass (*Zostera marina*) on the North Atlantic Coast, February 1938) it may be stated that some improvement has been noted. A recent (July and August) inspection of eastern Maine indicates an encouraging improvement, although the disease is still in evidence. In general, areas of reduced

salinity are making a good return. The present condition lends encouragement to the hope that the devastating "disease" will eventually pass and that the west coast plants will not succumb to the malady.

U. S. BIOLOGICAL SURVEY, Washington, D. C.

ENVIRONMENTAL FACTORS AND THE WASTING DISEASE OF EELGRASS

NEIL E. STEVENS

The causes of the wasting of eelgrass (*Zostera marina*) on both sides of the Atlantic continue to be the subject of investigation and speculation. Workers in the United States and in Great Britain now appear to be in agreement that whatever parasite or parasites may be associated with the disease, we are (5 p. 68) "forced to look for an explanation of the wide-spread disappearance of *Z. marina* in the ecology of the plant itself," or as Young states (6 p. 25), "A universal shift of some one or more environmental factors upsetting the physiological balance of *Zostera* or of its parasite, *Labyrinthula*." The writers quoted differ, however, as to the particular environmental factors which they regard as the most likely to be significant. Young points out a possible relation between the "local variations" in the amount of eelgrass observed throughout the diseased areas and changes in the salinity. Tutin, on the (5 p. 68) other hand, relates the sudden wide-spread disappearance to the fact that "In the British Isles the year 1931–32 showed a sunshine deficiency of about 20% below normal, and no other year in the past ten showed a deficiency approaching this." Atkins has challenged the validity of this conclusion and after reviewing the percentage of normal sunshine at various stations in the British Isles since 1897, concludes that (1 p. 209), "There is certainly no ground for attributing its [Zostera's] disappearance to any decrease in illumination leaving the plant, thus weakened, an easier prey to disease."

Neither writer considers sunshine data from the United States. It should be remembered that the sudden wasting of eelgrass was a very widespread phenomenon, and that any environmental factor or factors, in order to be worth considering in this connection, must be shown to have prevailed over a very large area. Fortunately, the

United States Meteorological Yearbooks (and the reports of the Chief of the Weather Bureau) give the total sunshine for all first order stations including, of course, a number on the Atlantic coast. The writer has recently tabulated these figures for several widely separated stations. Prior to 1930–1931, eelgrass flourished along our Atlantic coast under rather widely varying sunshine conditions, as indicated in Table 1.

Table 1. Sunshine Data for Certain Atlantic Coast Stations

Station	Average Percent Possible	Approximate Hours Average	Departure of Percent Possible from Normal 1929	1930	1931	1932
Eastport, Maine	50	2232	+2	−3	−1	+3
Boston, Mass.	57	2541	+2	+3	+2	+3
New Haven, Conn.	60	2673	+2	+3	+1	0
Wilmington, N. C.	66	2934	−6	+2	+4	+2

The first column gives the average percentage of possible total sunshine for the 20-year period 1915–1934, inclusive; the second column the approximate average number of hours of sunshine. The succeeding columns give the departure of the percent possible from the normal for each of the "critical" years, considering as normal the average of the period 1915–1934.

If the figures are computed on the basis of the period for which the water temperatures (3 p. 28) are above 50° F., the minimum set by Setchell (4) for vegetative growth, the results are much the same. Table 2 gives the data for Boston for the periods June to October inclusive, for 1915 to 1937.

Table 2. Percentage possible sunshine, June to October inclusive, at Boston, Massachusetts. Departure from average of years 1915–1934.

Year	Departure	Year	Departure	Year	Departure
1915	+1	1923	−2	1931	−2
1916	+4	1924	+5	1932	+6
1917	+2	1925	−2	1933	−2
1918	−4	1926	−6	1934	−8
1919	−4	1927	+2	1935	−6
1920	0	1928	−3	1936	+2
1921	+8	1929	+5	1937	0
1922	−2	1930	+3		

Examination of this table shows that in 1929 and 1930 there were more than the normal number of hours of sunshine at Boston, Mas-

sachusetts and in 1931 only a slight deficiency. There were periods of deficiency in 1918, 1919, and 1926 when there was certainly no wasting of eelgrass in eastern Massachusetts. There was a decided deficiency in 1934 and 1935 when the plant was making a perceptible if slow recovery. The available information from the Atlantic seaboard of the U. S. A. certainly supports Atkins rather than Tutin.

The suggestion that variations in salinity may, through their effect on the development of the Labyrinthula, influence the wasting of eelgrass, would seem to warrant further study. According to Young (6), the optimum range is from 15 to 22 per mille chlorinity. Using the formula given by Johnstone (2 p. 137) for conversion, this equals 27.1 per mille to 39.74 per mille salinity. In this connection attention should be called to the fact that the salinity of surface waters of the Mediterranean (2 p. 142) is notably high, 37 to 39 per mille, and since, as Johnstone points out, this high salinity is due to very limited inflow of fresh water, there must be many places along its shores where salinity rises well above Young's minimum of 15°/₀₀. Yet, according to Tutin, no report of the wasting disease has come from the Mediterranean. This would seem to be the place for further investigation.

University of Illinois
Urbana, Illinois

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CONTRIBUTIONS TO THE FLORA OF ALASKA

A. E. Porsild

(*Continued from p. 254*)

Viola biflora L.—Alaska Range: Broad Pass, rare in dry, open spruce woods, No. 70. Norton Sd.: volcanic hills back of Pastolik,

in fruit July 21, No. 921; volcanic hills back of Qiqertariaq, No. 1063; hills back of Unalaklet, No. 1158. SEWARD PEN.: Nome, Anvil Hill, No. 1408; Sawtooth Range, Grand Central Pk., *Thornton*, No. 177 (T). Rare or occasional in dry, open woods and willow thickets, perhaps limited to alpine regions.

V. biflora flowers very early and towards end of July has matured seed.

V. EPIPSILA Ledeb. *V. achyrophora* Greene, Pitt. **5**: 33 (1902).—KOKRINES MTS.: divide towards Melozitna R., in willow thickets by a stream, No. 764. NORTON SD.: volcanic hills back of Unalaklet, No. 1159. SEWARD PEN.: Nome, *Thornton*, No. 62 (T); north coast, Buckland R., No. 1594. Rare or occasional, in wet moss in alpine regions, perhaps throughout Alaska and the Yukon to the mouth of Mackenzie R.

Our material is very uniform and matches Lædebour's description. It also is a perfect match of *V. achyrophora* Greene, l. c., described from the Pribilof Islands, *J. M. Macoun*, No. 18.594 (Can).

V. LANGSDORFFII Fisch.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, rare on wet sphagnous margins of ponds, in flower June 26, No. 559.

V. Langsdorffiii in Alaska belongs to the Pacific slope flora and apparently does not cross the divide.

ELAEAGNUS COMMUTATA Bernh. *E. argentea* Pursh, not Moench.—ALASKA RANGE: Nenana Valley, Lignite, No. 309. HEAD OF CHITINA R.: *H. M. Laing*, No. 146.

New to the flora of Alaska.

SHEPHERDIA CANADENSIS (L.) Nutt.—FAIRBANKS: No. 203. ALASKA RANGE: Nenana Valley, Lignite, No. 310; Richardson Highw., between Paxon and Summit, No. 558. HEAD OF CHITINA R.: *H. M. Laing*, No. 145. Occasional on calcareous soil in the interior.

CIRCAEA ALPINA L.—TANANA R.: Hot Springs, No. 656.

Previously known from the Aleutian islands and the south coast.

EPILOBIUM ANGUSTIFOLIUM L.—FAIRBANKS: College, No. 233. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 435. HEAD OF CHITINA R.: *H. M. Laing*, No. 148. KOKRINES MTS.: divide towards Melozitna R., No. 766. NORTON SD.: Qiqertariaq, No. 1062. SEWARD PEN.: north coast, Kiwalik R., No. 1474 (the last two are var. INTERMEDIUM (Wormskj.) Fern.). Common throughout the region.

E. DAVURICUM Fisch.[1]—FAIRBANKS: in a muskeg, No. 196. ALASKA RANGE: Broad Pass, No. 71.

[1] The small-flowered species of *Epilobium* were determined by Prof. G. Samuelsson, Stockholm.

E. GLANDULOSUM Lehm.—TANANA R.: Hot Springs, Nos. 644 and 645.

In Alaska not recorded previously from north of 60°.

E. HORNEMANNI Rchb.—ALASKA RANGE: Nenana Valley, Healy, No. 359; Richardson Highw., Castner Glacier, No. 498; between Paxon and Summit, Nos. 551 and 552; Paxon, No. 581. SEWARD PEN.: Nome, No. 1374. Common on moist, alpine slopes of Alaska Range, rare or occasional in the Bering Sea region.

E. LATIFOLIUM L.—ALASKA RANGE: Nenana Valley, Healy, No. 360; Richardson Highw., between Paxon and Summit, No. 553; Paxon, No. 582 (var. ALBIFLORUM[1]). HEAD OF CHITINA R.: *H. M. Laing*, No. 147. KOKRINES MTS.: divide towards Melozitna R., No. 767. Common throughout the region, but in the interior perhaps restricted to alpine regions.

E. PALUSTRE L.—KOKRINES MTS.: divide towards Melozitna R., No. 765. YUKON DELTA: Kotlik, No. 873. NORTON SD.: Pastolik, No. 1006; Unalaklet, No. 1112; hills back of Unalaklet, No. 1157. SEWARD PEN.: Nome, No. 1373; Port Clarence, No. 1731; north coast, Buckland R., No. 1593. Common in muskegs and in wet tundra throughout the region, but in the interior perhaps restricted to alpine regions.

HIPPURIS TETRAPHYLLA L. fil.—NORTON SD.: brackish ponds near Pastolik, No. 1007; edge of brackish lagoon, Unalaklet, No. 1113.

Our material has ovate-lanceolate, fleshy leaves in verticels of 4 or 6 leaves and internodes much longer than in *H. vulgaris*. It well matches specimens from Finland, *e.g.* Pl. Finl. Exsicc. Nos. 1267 and 1268. According to Hultén, Fl. Kamtch. **3**: 153 (1929) *H. tetraphylla* has been collected previously in Alaska at Port Clarence.

H. VULGARIS L.—ALASKA RANGE: Broad Pass, No. 72. KOKRINES MTS.: divide towards Melozitna R., Nos. 768 and 769. YUKON R.: Holy Cross, No. 830. YUKON DELTA: Kotlik, No. 875; same place, No. 876. SEWARD PEN.: Nome, No. 1375; same place (f. FLUVIATILIS (Hoffm.) Coss. & Germ.), No. 1376; north coast, Kiwalik R., Nos. 1475 and 1476 (the last is f. FLUVIATILIS); Buckland R., No. 1599.

The first two numbers represent a curious form with a filiform, creeping and freely branching rhizome, with branches but 3 to 10 cm. long. It is not *H. montana* Ledeb. Common throughout the region, north at least to Kotzebue Sd.

MYRIOPHYLLUM ALTERNIFLORUM DC.—SEWARD PEN.: Buckland R., in shallow lake 1 to 2 ft. deep, No. 1600.

[1] EPILOBIUM LATIFOLIUM L. var. **albiflorum** (Nath.), n. comb. *Chamaenerium latifolium* (L.) Sweet var. *albiflora* Nath., Öfvers. Kgl. Sv. Vetensk.-Akad. Förh. 46 (1884); *Epilobium latifolium* L. ssp. *leucanthum* Ulke in Can. Field-Nat. **49**: 108 (1935).

Although our specimens are sterile they are placed here without much doubt because of the slender, almost filiform stems, long internodes and short leaves with capillary, strongly bent or reflexed segments. Hultén, Fl. Kamtch. **3**: 152 (1929), states that *M. alterniflorum* is not known to occur in Pacific North America, but recent discoveries in N. W. Mackenzie (*A. E. Porsild*, ined.) makes its occurrence in Alaska less unexpected.

M. EXALBESCENS Fern. in RHODORA, **21**: 120 (1919).—YUKON R.: Holy Cross, No. 829. YUKON DELTA: Kotlik, Nos. 877 and 878. NORTON SD.: Pastolik, No. 1008; Unalaklet, in a brackish lagoon, No. 1114. SEWARD PEN.: Port Clarence, *Fr. Johansen*, No. 564 (sterile fragments).

The first three numbers are in anthesis, while the rest are sterile. The large amount of material in the writer's collection from Alaska and N. W. Mackenzie in no respects differs from typical material from Eastern North America, whereas a single sheet in the National Herb. of Canada, from the Aleutian chain (Atka Isl., *Eyerdam*, No. 1282) by its rigid leaf-segments is a good match for Eurasian *M. spicatum*. The latter species according to Hegi, in Ill. Fl. v. Mittel-Europa, does not develop winter buds. In most of the material of *M. exalbescens* in the writer's collection well developed winter buds are present.

BUPLEURUM AMERICANUM Coult. & Rose, Rev. N. Am. Umbell. 115 (1888). *B. ranunculoides* L., Hook. Fl.-Bor. Am. **1**: 263 (1840); Kjellman, Vega Exp. Vetensk. Iakttag. **2**: 43 (1883).—ALASKA RANGE: Nenana Valley, Healy, No. 361; Richardson Highw., between Summit and McCarty, No. 433. KOKRINES MTS.: divide towards Melozitna R., Nos. 770 and 771. NORTON SD.: hills back of Pastolik, Nos. 920 and 920-A; hills back of Qiqertariaq, No. 1065. SEWARD PEN.: Nome, *Thornton* No. 418 (T). Common in dry, gravelly places, north to Seward Pen.

Coulter and Rose, l. c., cite a specimen said to have been collected by Capt. Hooper on Herald Island. The general distribution of the species strongly suggests that the above cited specimen came from somewhere else.

Hultén, Fl. Kamtch. **3**: 157 (1929), suggests that the Alaska plant is conspecific with the Asiatic *B. triradiatum* Adams, but the following passage in Ledebour's description (Fl. Ross. **2**: 264): "foliis radicalibus oblongis; caulinis oblongis ovatisve cordatis amplexicaulibus—" does not seem to make it possible to place the American plant there.

CICUTA MACKENZIEANA Raup in Journ. Arnold Arboretum, **17**: 279 (1936).—YUKON DELTA: Kotlik, No. 879. NORTON SD.: low tundra

at Pastolik, No. 1011. SEWARD PEN.: north coast, Buckland R., No. 1601. Apparently occasional in low, marshy tundra and on margins of lakes throughout northern Alaska, Yukon and the Northwest Territories, east to Hudson Bay and north to the Mackenzie Delta.

Cicuta mackenzieana, described from Lake Athabasca of N. W. Canada, no doubt is closely related to *C. virosa* of the Old World, which in Alaska barely enters the N. American continent. It differs from that species chiefly by its much narrower, subentire leaf-segments and by its slightly smaller flowers and fruit. *C. mackenzieana* in Alaska grows in water from a few inches to two feet deep; as in *C. virosa* the root is long-fusiform, hollow and septate, with numerous verticils of fibrous roots from the lower nodes of the stem.

The reindeer in Alaska eagerly, and apparently with impunity, eat the stem and leaves of *C. mackenzieana*. An instance of fatal poisoning in the case of an Eskimo child, from the eating of the root, was reported from near St. Michaels during the time of the writer's visit. *Cicuta mackenzieana* is new to the flora of Alaska.

CICUTA VIROSA L. *C. purpurea* Greene, Pitt. **2**: 8 (1889) saltem quoad pl. Alaskana; ? *C. Douglasii* (DC.) Coult. & Rose in Contr. U.S. Nat. Herb. **7**: 95 (1900).—TANANA R.: Hot Springs, No. 646. New to the flora of central Alaska.

LIGUSTICUM HULTENII Fern. in RHODORA, **32**: 8, tab. 194 (1930). *L. scothicum* auctt. Fl. Am. bor. occid. et As. orient. non L.—NORTON SD.: Qiqertariaq, No. 1087. SEWARD PEN.: south coast, Bluff, No. 1264. Common on sea-beaches of the Bering Sea coasts, north to Kotzebue Sd.

L. MACOUNII Coult. & Rose in Contr. U. S. Nat. Herb. **1**: 289, tab. 23 (1893); *iidem*, Contr. U. S. Nat. Herb. **7**: 139 (1900).—KOKRINES MTS.: divide towards Melozitna R., No. 773. NORTON SD.: hills back of Pastolik, No. 919; volcanic hills back of Qiqertariaq, No. 1064. SEWARD PEN.: Nome, Mt. Tumit, 1500 feet elev., *Thornton*, No. 429 (T).

Coulter & Rose, l. c., describe the flowers and fruit as purple or dark purple, which is correct during the early stages of anthesis and fructification, when, also, the involucels, involucre and scapes are dark-tinged with anthocyanin. Towards maturity the coloring disappears and the mature mericarps are straw-colored. In the co-type, Cape Vancouver (south of the Yukon delta), *J. M. Macoun*, No. 20.447 (Can) this change has taken place in a few of the mericarps. The strongly nerved, white hyaline-margined stipules persist for many years.

This plant, hitherto known from the type locality only, is rare or occasional in dry, gravelly places in the mountains of the Bering Sea region, where it is nearly always found associated with *Cetraria nivalis*.

From the Chuck peninsula is reported the very closely related *L. mutelloides* ssp. *alpinum* (Ledeb.) Thellung (*Pachypleurum alpinum* Ledeb., Fl. Alt. **1**: 397), which differs in having the basal leaves doubly pinnate-dissected and by having but a single cauline leaf.

Coelopleurum Gmelini (DC.) Ledeb.—Kokrines Mts.: divide towards Melozitna R., No. 772. Norton Sd.: low tundra, Pastolik, No. 1012; Qiqertariaq, No. 1089. Seward Pen.: Nome, *Thornton*, Nos. 5 and 189 (T). Occasional in moist places, often near running water, north to Kotzebue Sd.

The plant recorded by Eastwood (p. 208) as *Heracleum lanatum* from Seward Pen. probably belongs here. Records of *Angelica* (or *Archangelica*) *officinalis* from N. W. Alaska (Kjellman p. 43; Rothr. p. 447) no doubt also belong here (see also Hultén 1936). The last mentioned writer remarks that in the Aleutian islands the young leaf-stalks, like those of *Angelica officinalis* of Northern Europe, are eaten by native children. The writer tasted the stalks of *Coelopleurum Gmelini* wherever met but always found the flavor disagreeable.

Conioselinum **cnidiifolium** (Turcz.), n. comb. *Selinum cnidiifolium* Turcz. in Bull. Soc. Natur. de Mosc. 72 (1840); Ledebour, Fl. Ross. **2**: 293 (1844); Kjellman, Vega Exp. Vetensk. Iakttag. **2**: 43 (1883); Steffen, Bot. Centralbl. **54**, B: 553 (1936); *Conioselinum Dawsoni* (Coult. & Rose) Coult. & Rose in Contr. U. S. Nat. Herb. **7**: 152 (1900); ? *C. Fischeri* Hook., Fl. Bor.-Am. **1**: 266 non Wimm. & Grab.—Alaska Range: Richardson Highw., between Summit and McCarty, No. 434. Seward Pen.: south coast, Bluff, No. 1263. Common in sandy places such as riverbanks, margins of lakes and seashores throughout the region east to Cape Bathurst (long. 128° W.).

Ostenfeld (Gjöa Exp. 58) has already pointed out that there is little doubt l ut that the American plant, described by Coulter & Rose, l. c., as *C. Dawsoni* from Pelly R., Yukon Territory (*Dawson* No. 23), of which the co-type is preserved in the National Herbarium of Canada (No. 9292), is conspecific with *Selinum cnidiifolium* Turcz., from E. Siberia "inter Jakutzk et fl. Aldan"; and it is obvious that Coulter and Rose, l. c., overlooked the fact that it had been recorded from America (Port Clarence, Alaska) by Kjellman. Ostenfeld, l. c., who did not have mature fruit, considered the species best left in the genus *Selinum* because "it has oil tubes single in the intervals and two

oil tubes on the commissural side" and because he found the lateral wings "not being considerably broader than the dorsal. The fruit—at least the immature one—is not dorsally flattened."

With the abundant material now available, from Alaska, Yukon Territory and from northwestern Mackenzie district, and with abundance of mature fruit, it is obvious that the mature carpels are decidedly flattened. The lateral ribs are one and one-half times as wide as the prominent dorsal ones. The oil-tubes on the other hand are very prominent, and, as in *Selinum* of the Old World, in fresh material at least are visible from the ouside. There are two on the commissural side, but often five on the dorsal side.

The broad, membranaceous-margined involucels, ending abruptly in a prominent attenuation, as described by Turczaninow, Coulter and Rose and Ostenfeld, are very characteristic in the large amount of material on hand. In the young umbels the involucels and petals are often purplish-tinged with anthocyanin, but soon become white. The flowers are strongly protandrous. In the unopened flower the filaments are abruptly bent, with the anther resting against the pistil. In this stage the tip of the petals is depressed and almost completely envelops the anther.

If the genus *Selinum* is to be excluded from the flora of North America, as is done by Coulter and Rose, in which they are followed in such modern treatments as Thellung's in Hegi, Ill. Flora v. Mittel-Europa, our plant must be transferred to *Conioselinum*.

C. Benthami (Wats.) Fernald in Rhodora, **28**: 221 (1926). *Selinum Benthami* Wats., Bibl. Ind. 432 (1878). *Ligusticum Gmelini* Cham. & Schlecht. in Linnaea, **1**: 391 (1826), as to plant (of Unalaska, Bay St. Lawrence, etc.) described, not as to Gmelin plate cited. *C. Gmelini* (Cham. & Schlecht.) Coult. & Rose in Contrib. U. S. Nat. Herb. **7**: 150 (1900), not Steud. (1840). For discussion of nomenclature see Fernald, Rhodora, l. c.—Norton Sd.: Qiqertariaq, in moist sandy places, No. 1088.

According to Hooker & Arnott in Bot. Beech. Voy. **1**: 124 collected by Messrs. Lay & Collie in Kotzebue Sd. but, as Hooker later, in Fl. Bor.-Am. **2**: 266, under *C. Fischeri* definitely confused *C. Benthami* with *C. cnidiifolium*, the record needs verification.

Professor Fernald supplies the following memorandum upon the conflicting nomenclature of *Conioselinum Gmelini*. "In his Flora Sibirica **1**: 195 (1747) Gmelin had an *Angelica foliis pennatifidis*, described as growing 'in omni Sibiria' and illustrated by a life-size

plate (xliv). Bray in Denkschr. Bot. Ges. Regensb. **1**. pt. 2: 36 (1818), in a paper on new and rare plants of Livonia, described in detail as new *Selinum Gmelini*, but citing also the Gmelin description and plate. Since Gmelin's plant was not published with a binomial and was pre-Linnean it has no status under binomial nomenclature unless it alone is the basis of a binomial, and it should not be given preference over the actual Livonian material which Bray had before him. *S. Gmelini* Bray (1818) is the characteristic plant of northern and eastern Europe now placed in *Conioselinum*.

"In 1826 Chamisso & Schlechtendal described a quite different species from the Bering Sea region as *Ligusticum Gmelini* Cham. & Schlecht. in Linnaea, **1**: 391 (1826), describing in detail the actual plant of Unalaska and the Bering Sea coasts, but, like Bray, also citing the Gmelin *Angelica foliis pennatifidis*. There was already a *Ligusticum Gmelini* Villar, Prosp. 24 (1779), therefore Chamisso & Schlechtendal's name was illegitimate, as a later homonym. However, Steudel, with unexcelled impartiality, took up all the elements (except that of Villar) as belonging about equally to two different species. In his Nomenclator, ed. 2: 403, 404 (1840) Steudel first placed under *Conioselinum Fischeri* Wimm. & Grab. (1827) of 'Sibir. Tart. Siles.' all three synonyms: 'C. Gmelini. *Bray.* ?' (thus coining a new but perhaps unintentional combination in synonymy), followed by several other synonyms, including 'Ligusticum Gmelini *Cham. Schlecht.*' and 'Angelica nr. 10. *Gmel.* sibr.' But two species further down in Steudel we get again the new combination *C. Gmelini* Steud. (this time properly made for a plant said to be of Siberia), again with the same three synonyms, except that no doubt is expressed as to *Selinum Gmelini* of Bray. Since the latter was the earlier of the two binomials, *Selinum Gmelini* Bray (1818) and *Ligusticum Gmelini* Cham. & Schlecht. (1826) (this an illegitimate name), we must accept *Conioselinum Gmelini* (Bray) Steud. as the well known plant of northern Europe.

"That, however, is not the end of the matter. In 1900 Coulter & Rose made another *Conioselinum Gmelini* (Cham. & Schlecht.) Coult. & Rose, based on the illegitimate *Ligusticum Gmelini* Cham. & Schlecht. (1826), for the plant of the Bering Sea region. Obviously, they could not, under the rules, give the name *C. Gmelini* to a second species the more so since this second and illegitimate combination was itself based on an illegitimate name. *Selinum Benthami* Wats. (1878) had been

properly published and should have been made the basis of a new combination, which Coulter & Rose did not make."

Heracleum lanatum Michx.—Alaska Range: Richardson Highw. between Paxon and Summit, Nos. 554 and 555. Common in moist, alpine slopes of the Alaska Range north to the divide where it attains a height of six feet or more.

The record from Seward Pen. (Eastwood p. 208) probably should be referred to *Coelopleurum Gmelini*. The strong aromatic odor, suggestive of celery salt, is very noticeable in all parts of the plant when dry. In herbarium specimens 60 years old the odor is still quite noticeable.

Cornus canadensis L.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 143. Head of Chitina R.: *H. M. Laing*, No. 149. Kokrines Mts.: divide towards Melozitna R., No. 777. Rare or occasional in open woods of the interior.

C. canadensis L. var. intermedia Farr. in Contr. Bot. Lab. Univ. Pa. **2**: 423 (1904). *C. unalaschkensis* Ledeb., Fl. Ross. **2**: 378 (1844); *C. canadensis* L. × *suecica* L., Hult. Fl. Aleut. 253 (1937).—Kokrines Mts.: divide towards Melozitna R., No. 778. Head of Chitina R.: *H. M. Laing*, No. 149.

This puzzling plant apparently is not uncommon throughout central Alaska and Yukon. As pointed out by Hultén, l. c., it seems to be intermediate between *C. canadensis* and *C. suecica* and, according to him, is merely a hybrid. Where the two species occur together, as is the case in S. W. Alaska and Atlantic North America, the hybrid-origin of our plant at first appears reasonable; but, as pointed out to the writer by Professor Fernald, it is decidedly open to question when the general distribution of the two hypothetical parents is taken into consideration. In America *C. suecica* is restricted to a comparatively small area in western Alaska and to an equally restricted area in the East, centering around southern Labrador and the Gulf of St. Lawrence. *Cornus canadensis* L. var. *intermedia* is common or occasional not only in boreal parts of Alaska, Yukon and Eastern America but also in mountains of British Columbia and Alberta, more than a thousand kilometers from the nearest station of *C. suecica*.

C. stolonifera Michx. var. Baileyi (Coulter & Evans) Drescher. —Tanana R.: in thickets along riverbank at McCarty, near the confluence of Delta R., No. 377. Yukon R.: between Ramparts and Tanana, *L. J. Palmer*, No. 48.

The young branches and pedicels are covered with a densely matted brown tomentum.

C. SUECICA L.—ALASKA RANGE: Broad Pass, No. 73. SEWARD PEN.: Nome, Anvil Hill, No. 1377; north coast, Buckland R., No. 1602. Common in dry tundra in the Bering Sea region, north to Kotzebue Sd.

MONESES UNIFLORA (L.) Gray.—FAIRBANKS: in a muskeg, No. 201. ALASKA RANGE: Broad Pass, No. 76; Nenana Valley, Healy, No. 362; Richardson Highw., between Summit and McCarty, No. 436 (var. RETICULATA). HEAD OF CHITINA R.: *H. M. Laing*, No. 150. YUKON R.: Birches, No. 609 (var. RETICULATA). KOKRINES MTS.: 800 ft. elevation, No. 678. NORTON SD.: wooded hills back of Unalaklet, No. 1160 (transitional to var. RETICULATA). A common woodland species of the interior, rare or occasional in the Bering Sea region, north to Norton Sd. Not previously recorded from north of the Pacific coast.

The var. *reticulata* (Nutt.) Blake in RHODORA, **17**: 28 (1915), as pointed out by Blake, because of the numerous intermediate forms between it and the species is best treated as a variety. Although it appears to be a strictly western form, the writer has seen a single collection from the Gulf of St. Lawrence, St. Paul Isl., *Perry & Roscoe*, No. 300 (Can).

PYROLA ASARIFOLIA Michx. var. INCARNATA (DC.) Fern.—FAIRBANKS: in wet, alluvial clay by a stream, specimens not yet in flower on June 14, No. 198. ALASKA RANGE: Richardson Highw., between Summit and McCarty, flowering specimens from sunny slope among willows, June 28, No. 437. SEWARD PEN.: north coast, Kiwalik R., No. 1477.

The specimens in the last mentioned number are sterile and when collected did not appear to have flowered that season. Because of the orbicular-reniform leaves and the dilated petioles they are placed here. A southern woodland species, rare or occasional in the interior lowland, also known from the Pacific coast and central Yukon Territory.

PYROLA CHLORANTHA SW.—FAIRBANKS: in wet alluvial clay near a stream, flowers just opening on June 14, No. 199. HEAD OF CHITINA R.: *H. M. Laing*, No. 154. A woodland species, rare or occasional in central Alaska.

Apparently new to the flora of Alaska.

P. GRANDIFLORA Radius, Diss. Pyrola 27 (1821). *P. rotundifolia* var. *pumila* Hornem., Dansk Oecon. Pl. ed. 3, 463 (1821); *P. groenlandica* Hornem., Fl. Dan. tab. 1817 (1840); ? *P. occidentalis* R. Br. in D. Don, Mem. Wern. Soc. **5**: 232 (1824).—ALASKA RANGE: Broad Pass, common locally on alpine slopes in open spruce and birch woods, flowering on June 8–11, No. 74. SEWARD PEN.: Nome, *Thornton*, No. 326 (T). NORTH COAST OF ALASKA: Camden B., *Can. Arct. Exp.* No.

33. In central Alaska perhaps limited to high mountains; common on the arctic coast, elsewhere perhaps replaced by the var. *canadensis*.

P. grandiflora in arctic and boreal North America has from time to time been confused with forms of *P. asarifolia* and its var. *incarnata* (*P. uliginosa*) and with forms of *P. rotundifolia*.[1] In life these species are very easily distinguished but in the herbarium are sometimes hard to separate. The writer has found in the color of the anthers a character which appears constant and which has the advantage of being easily observed. In all phases of *P. grandiflora* the anthers are bright lemon-yellow; in *P. asarifolia* and its var. *incarnata* they are deep purplish-red, while in all phases of *P. rotundifolia* known to the writer the anthers are of a deep golden-yellow. The *P. grandiflora* complex may further be separated from the others by the thin, translucent and strongly veined petals. In life the petals of *P. grandiflora* and its varities are of a creamy white, often tinged with pink, but never pure white nor fleshy as in *P. rotundifolia*, nor the deep pink or crimson of *P. asarifolia*. In all shades the veins are conspicuous. In drying, the petals as a rule turn dirty reddish-brown, but always leave a conspicuous pale, whitish margin. This character has been found constant in the several hundreds of sheets examined. In *P. asarifolia* and *P. rotundifolia* the petals are thick and opaque, not conspicuously veined and always without a pale margin.

P. grandiflora in the east presents no problems but from the west have been described several closely related species: *P. canadensis* Andres (*P. borealis* Rydb.), *P. Gormanii* Rydb. and *P. occidentalis* R. Br. Typical material of the first two is easily distinguished from *P. grandiflora*, but on account of the numerous transitional forms present when a large amount of material is examined it seems best to treat these as geographical varieties or races of the circumpolar *P. grandiflora*. The var. *canadensis* is common in Alaska, Yukon and N. W. Canada and the writer is well acquainted with it from studies in the field; of the var. *Gormanii*, in addition to the type, he has seen but few collections. Of *P. occidentalis* he has seen no authentic material. Andres, in Allgem. Bot. Zeitschr. **19**: 82 (1914), has shown that it is not, as suggested in Gray's Syn. Fl., a variety of *P. chlorantha*. From the description in Hook. Fl. Bor.-Am. **2**: 47 (1840) and the distribution (the type came from Seward Pen.) the writer thinks it merely a thin-leaved form of *P. grandiflora*.

[1] For a discussion of *P. grandiflora* in Greenland and eastern arctic Canada see M. P. Porsild in Medd. om Grønl. **58**: 117 (1920) and M. O. Malte in Rhodora **36**: 182 (1934).

The relationship to the species of these two little known varieties is exemplified in the following table:

	var. TYPICA	var. CANADENSIS	var. GORMANII
leaf:	orbicular to ovate-acute, entire	orbicular, entire	ovate-acute, denticulate by excurrent veins
petiole:	equalling blade	longer than blade	equalling blade
scape including inflorescence:	rarely exceeding 15 cm., pink	rarely less than 20 cm., green	rarely exceeding 15 cm., pink
inflorescence:	short, with few and large flowers, of 2.0–2.5 cm. diam.	long, with many small flowers, these rarely over 1.5 cm. diam.	short, with few and large flowers
sepals:	lanceolate, erose at apex	deltoid, entire	deltoid, entire
filaments:	strongly dilated below middle	filiform, not conspicuously dilated	filiform, not conspicuously dilated
style:	stout, thickened both ways	filiform, barely thickened above	filiform, thickened above
scent:	strongly perfumed	odorless	perfumed

It will be noticed from the table that the var. *Gormanii* is closer to the species than is var. *canadensis*.

P. GRANDIFLORA Radius var. **canadensis** (Andres), n. comb. *P. canadensis* Andres in Oest. Bot. Zeitschr. **63**: 250 (1913); *P. borealis* Rydb. in N. Am. Fl. **29**, 1: 24 (1914); *P. asarifolia* Michx. var. *incarnata* sensu Raup, Journ. Arnold Arb. **17**: 283 (1936) non DC. (in part).—FAIRBANKS: in a muskeg, flowering specimens, June 14, No. 197; College, No. 234. HEAD OF CHITINA R.: *H. M. Laing*, No. 152. KOKRINES MTS.: divide towards Melozitna R., No. 774. SEWARD PEN.: Buckland R., fruiting specimens, No. 1603. Common throughout wooded parts of the region; rare or occasional in willow thickets of the Bering Sea region, north to Kotzebue Sd. Common also through the Yukon Territory east to Bear Lake, north to the Mackenzie Delta and south to northern B. C.

Not previously recorded from Alaska.

In addition to the large series in the writer's collection from N. W. Mackenzie district, the following numbers, all in the National Herbarium of Canada, should be referred to the var. *canadensis:* N. W. T.: Mackenzie R., Bear Rock, Ft. Norman, *Hume*, No. 103.428. SLAVE LAKE: Ft. Rae, *Russell*, No. 10; *Brooke*, No. 12; *Seton & Preble*, No. 78.347. SLAVE R.: Ft. Smith, *Taylor*, No. 15.793. WOOD BUFFALO PK.: Caribou Mts., *Raup*, No. 2959; Pine Lake district, *idem*, Nos. 2956–7 (the last three distributed as *P. asarifolia* var. *incarnata*).

P. GRANDIFLORA Radius var. **Gormanii** (Rydb.), n. comb. *P. Gormanii* Rydb. in N. Am. Fl. **29**, 1: 24 (1914).—HEAD OF CHITINA R.: moist woods, 2000 feet elevation, *H. M. Laing*, No. 153.

Previously known only from the type collection: YUKON TERR.: Dry Gulch, *Gorman*, No. 1029 (in part) (NY, Can). New to the flora of Alaska.

P. MINOR L.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, rare on sandy mountain slope, flowering specimens on June 26, No. 556. KOKRINES MTS.: divide towards Melozitna R., willow thickets on river flat, Nos. 775 & 776. Rare or occasional and, as elsewhere, of strangely disrupted range.

In Alaska not previously recorded from north of the Pacific coast.

P. SECUNDA L.—HEAD OF CHITINA R.: *H. M. Laing*, No. 151.

A woodland species not previously recorded from Alaska.

P. SECUNDA L. var. OBTUSATA Turcz.—FAIRBANKS: in a muskeg, No. 200. ALASKA RANGE: Broad Pass, flowering specimens on June 8–11, No. 75. YUKON R.: Birches, No. 610. NORTON SD.: tundra ridges at Pastolik, No. 1013. Rare or occasional in dry spruce woods of the interior, where it appears to be much less common than in corresponding parts of northern Canada; apparently rare in the Bering Sea region, in favored habitats north to Kotzebue Sd., Eschscholtz B. (*Chamisso*).

The var. *obtusata* Turcz., although it differs from the species only in vegetative characters, seems quite distinct:

	VAR. OBTUSATA	VAR. TYPICA
leaves:	elliptic-orbicular, pale yellowish-green, dull, 1.5 x 1.0 cm.	elliptic-lanceolate, acuminate, dark olive-green, 3.0 x 1.5 cm.
stem:	short, few-leaved	elongated, ± trailing, leafy
raceme:	few-flowered, short	many-flowered, long

The var. *obtusata* in its distribution is circumpolar; it is a characteristic plant of northern coniferous forests, but in N. America reaches far north of the tree limit.

LEDUM DECUMBENS (Ait.) Small.—ALASKA RANGE: Broad Pass, No. 78. SEWARD PEN.: Nome, *Thornton*, No. 488 (T); north coast, Buckland R., No. 1608. An arctic species common in the Bering Sea region; in the interior limited to high mountains or to cold muskeg bogs of the lowland.

L. GROENLANDICUM Oeder.—FAIRBANKS: College, No. 235. HEAD OF CHITINA R.: *H. M. Laing*, Nos. 156 and 157. Common in the interior in cold woods and in muskegs.

RHODODENDRON KAMTCHATICUM Pall. ssp. GLANDULOSUM (Standl.) Hultén, Fl. Kamtch. **4**: 15 (1930). *Therorhodium glandulosum* Standl. in N. Am. Fl. **29**, 1: 45 (1914).—SEWARD PEN.: Nome, Anvil Hill, No. 1378; *Thornton*, Nos. 24, 163 and 397 (T); Port Clarence, *Walpole*,

No. 1725 (US). The last mentioned number is the type of ssp. *glandulosum*. Occasional on dry mountain slopes of Seward Pen.

Rh. lapponicum (L.) Wahlenb.—Alaska Range: Broad Pass, No. 79. Seward Pen.: Nome, *Thornton*, Nos. 162 and 494 (T). Common on dry mountain slopes of the Bering Sea region; in the interior perhaps limited to alpine regions.

Loiseleuria procumbens (L.) Desv.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 144. Alaska Range: Broad Pass, No. 80. Seward Pen.: Nome, *Thornton*, Nos. 24, 183, and 488 (T); north coast, Buckland R., Clem Mt. No. 1610. Rare or occasional; on acid, crystalline rock only.

Cassiope tetragona (L.) D. Don.—Head of Chitina R.: *H. M. Laing*, Nos. 163 and 164. Kokrines Mts.: divide towards Melozitna R., No. 782. Seward Pen.: Nome, *Thornton*, Nos. 75 and 494. Diomede Isl.: No. 1715. Common everywhere in the Bering Sea region; in the interior on high mountains only.

Andromeda Polifolia L.—Alaska Range: Broad Pass, No. 81; mountains between Healy and Moody Creeks, No. 266; Richardson Highw., between Paxon and Summit, No. 557. Head of Chitina R.: *H. M. Laing*, No. 165. Seward Pen.: south coast, Bluff, No. 1272; Nome, No. 1379; north coast, Buckland R., No. 1607. Common in muskegs and tundra throughout the region.

Chamaedaphne calyculata (L.) Moench.—Fairbanks: Smith Lake, No. 598. Seward Pen.: north coast, Buckland R., No. 1606. Common in muskegs and cold woods of the interior. In the Bering Sea region north to Kotzebue Sd. but apparently always at a considerable distance from the sea-coast.

Arctostaphylos alpina (L.) Spreng.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 146. Alaska Range: Broad Pass, No. 82-A. Seward Pen.: Port Clarence, No. 1442; north coast, Kiwalik R., No. 1478. Common in the Bering Sea region chiefly on acid, crystalline rock.

A. rubra (Rehd. & Wils.) Fern. See Rhodora, **16**: 32 (1914).—Alaska Range: Broad Pass, No. 82. Head of Chitina R.: *H. M. Laing*, Nos. 158–160. Occasional on calcareous soil in mountains of the interior.

A. Uva-Ursi (L.) Spreng.—Alaska Range: Richardson Highw., between Summit and McCarty, No. 438. Head of Chitina R.: *H. M. Laing*, Nos. 161 and 162. Kokrines Mts.: divide towards Melozitna R., No. 779. Occasional in calcareous soil on dry mountain slopes of the interior.

The report by Rothrock from Seward Pen. needs confirmation.

Oxycoccus microcarpus Turcz. See Porsild in Can. Field-Nat. **52**: 116–117 (1938).—Alaska Range: Broad Pass, No. 84; mountains between Healy and Moody Creeks, above timber line, No. 267; Richardson Highw., Paxon, No. 583. Norton Sd.: Unalaklet, No.

1161. SEWARD PEN.: north coast, Buckland R., No. 1605. Common in sphagnum bogs.

VACCINIUM CESPITOSUM Michx.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 500.

The reports from the north coast of Alaska, by Macoun and Holm, from Camden Bay, Can. Arct. Exp. No. 7, as well as from Herschel Isl., No. 551, are based upon sterile specimens of *Salix phlebophylla*. The species does not otherwise appear to have been recorded from north of Sitka.

V. ULIGINOSUM L. var. ALPINUM Big.—HEAD OF CHITINA R.: *H. M. Laing*, Nos. 167–168. Common throughout, but in the interior perhaps not general except on higher mountains.

In the Bering Sea region the fruit is gathered in large quantities, shortly before the snow covers the ground. The berries are placed in a barrel and permitted to ferment. The dark purplish rather vile-tasting product is much relished locally.

V. VITIS-IDAEA L. var. MINUS Lodd.—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 145; College, No. 236. ALASKA RANGE: Broad Pass, No. 83. HEAD OF CHITINA R.: *H. M. Laing*, No. 166. KOKRINES MTS.: divide towards Melozitna R., No. 780. SEWARD PEN.: north coast, Kiwalik R., No. 1479; Buckland R., No. 1604. DIOMEDE ISL.: No. 1716. Common in muskegs throughout the region.

DIAPENSIA OBOVATA (Fr. Schm.) Nakai. See Porsild in Trans. Royal Soc. of Can. ser. 3, sect. 5, **32**: 35 (1938). ALASKA RANGE: Broad Pass, No. 85; Healy, *J. P. Anderson*, No. 1848 (NY). KOKRINES MTS.: divide towards Melozitna R., No. 781. SEWARD PEN.: Nome, *Thornton*, No. 74 (T); north coast, Buckland R., No. 1611. DIOMEDE ISL.: No. 1717. Rare or occasional on acid crystalline rock. All material of *Diapensia* from Alaska-Yukon, seen by the writer, belongs to *D. obovata*.

PRIMULA BOREALIS Duby.—KOKRINES MTS.: No. 679. NORTON SD.: Pastolik, No. 1014; Qiqertariaq, wet meadows, No. 1091. SEWARD PEN.: Nome, No. 1382-A. Perhaps common throughout, but in the interior restricted to alpine regions.

PR. CUNEIFOLIA Lœdeb. ssp. SAXIFRAGIFOLIA (Lehm.) Hultén.—NORTON SD.: Golofnin B. wet meadow near lagoon, No. 1173.

Our specimens are one-flowered, the pedicels are minutely pubescent, the leaves fleshy, cuneate-spathulate. Rare or occasional in the Bering Sea region, north to Kotzebue Sd.

PR. EGALIKSENSIS Wormskj.—ALASKA RANGE: mountains between Healy and Moody creeks, No. 269; Nenana Valley, Lignite, No. 311. Moist, calcareous soil of alpine regions of the interior.

Not previously recorded from north of the Aleutian chain and the south coast.

Pr. eximia Greene. See Hultén, Fl. Kamtch. **4**: 50 (1930).—Diomede Isl.: No. 1718. Common on islands of Bering Sea.

In addition the writer has seen a sheet from mountains of Yukon: 63° 50′ N. 141° W. *D. D. Cairnes*, No. 93.324, which undoubtedly belongs here.

Pr. incana M. E. Jones.—Richardson Highw.: Tanana R., near junction of Delta R., springy places in poplar woods, No. 378.

New to the flora of Alaska.

Pr. sibirica Jacq.—Norton Sd.: Qiqertariaq, wet meadows, No. 1090. Seward Pen.: Nome, wet meadow by Dexter Cr., No. 1383.

No previous records from north of Kuskokwim R.

Pr. stricta Hornem.—Seward Pen.: Nome, wet meadows by Dexter Cr. Nos. 1381 and 1382; Port Clarence, No. 1445. Rare or occasional in the Bering Sea region north to Wainwright Inlet (Seem.).

Douglasia arctica Hook., Fl. Bor.-Am. **2**: 120 (1840).

The writer has seen a sheet, collected by the U. S. Polar Expedition in "Bering Strait," labelled *Androsace arctica* Cham. & Schlecht (NY). According to Hultén in Sv. Bot. Tidskr. **30**, 3: 528 (1936) known from St. Lawrence Island; otherwise known only from mountains and sea-coast west of Mackenzie delta.

Androsace Chamaejasme Host var. arctica R. Knuth in Engler, Pflanzenr. **4**, 22: 190 (1905).—Alaska Range: Broad Pass, No. 62-A; mountains between Healy and Moody creeks, No. 268; Nenana Valley, Healy, No. 365. Yukon R.: between Ramparts and Tanana, *L. J. Palmer*, No. 44. Seward Pen.: south coast, Bluff, No. 1266; Nome, No. 1380; Port Clarence, No. 1443. Common in sandy and gravelly places on calcareous soil; in the interior restricted to alpine regions.

A. septentrionalis L. s. lat.—Alaska Range: Nenana Valley, Healy, by a cold spring, No. 364. Head of Chitina R.: *H. M. Laing*, Nos. 170–172. Seward Pen.: south coast, Bluff, No. 1267; Port Clarence, No. 1444.

In Alaska apparently a less common species than in corresponding parts of N. W. Canada.

Lysimachia thyrsiflora L.—Fairbanks: Smith Lake, No. 603. Yukon R.: Holy Cross, No. 832.

Apparently new to the flora of Alaska.

Trientalis europaea L. ssp. arctica (Fisch.) Hultén; see his Fl. Kamtch. **4**: 56–59 (1930).—Fairbanks: *Picea* swamps, No. 202-A.

Alaska Range: Broad Pass, No. 62; Richardson Highw., Castner Glacier, Nos. 501 and 502. Kokrines Mts.: divide towards Melozitna R., Nos. 783 and 784. Yukon Delta: Kotlik, Nos. 880 and 881. Seward Pen.: Nome, *Thornton*, Nos. 41, 43 and 175 (T). Common in wooded parts of the interior; in the Bering Sea region rare in willow and alder thickets north to Seward Pen.

Dodecatheon frigidum Cham. & Schlecht. in Linnaea **1**: 222 (1826); Seemann, Bot. Herald Voy. 38, tab. 9 (1852).—Alaska Range: Broad Pass, moist, alpine meadows above timber line, No. 86; Richardson Highw., between Paxon and Summit, in a creek bed, No. 562; Paxon, above timber line, No. 584. Head of Chitina R.: *H. M. Laing*, No. 169. Kokrines Mts.: near sulphur springs, No. 680; divide towards Melozitna R., No. 785. Seward Pen.: Nome, *Thornton*, Nos. 61, 182 and 481 (T). Rare or occasional in moist, alpine meadows and snow-flushes of the interior; in the Bering Sea region in similar places at sea-level.

The Alaska plant has ovate-cordate, repand-dentate leaves; the upper part of the scape and the peduncles are minutely glandular-pubescent.

D. integrifolium Michx., Fl. Bor.-Am. **1**: 123 (1803).

Hultén, Fl. Aleut. 274, questions the record of this species in Ledebour, Fl. Ross. from "Kodiak and Unalaschka." In the National Herbarium of Canada is a sheet from Kodiak Isl., *J. M. Macoun*, No. 16.761.

Armeria vulgaris Willd. ssp. arctica (Wallr.) Hultén, Fl. Aleut. 275 (1937); for synonymy of the Alaska plant see Hultén l. c.—Seward Pen.: south coast, Bluff, on talus under a bird cliff, No. 1265; Port Clarence, wet meadows by the sea-shore, No. 1446; Nome, Anvil Hill, dry gravelly slope, No. 1389.

The first two numbers are the sea-shore plant with strongly ciliate leaves (typical ssp. *arctica*); in the last number the leaves are sparingly ciliate but the pubescence of the calyx is clearly that of the ssp. *arctica*. Both forms are fairly common in the Bering Sea region, north at least to Seward Pen.

Gentiana algida Pall. *G. frigida* Gray, not Haenke.—Seward Pen.: Nome, moist, grassy slopes of Anvil Hill, No. 1386; Nome, *Thornton*, Nos. 6 and 227 (T).

Our specimens mostly have a single pair of flowers, a few have single flowers, while some have an additional axillary flower. In our area apparently rare or occasional on moist alpine slopes of Seward Pen. and islands of the Bering Sea where it is a late-flowering species that perhaps does not mature seed except in favorable years. The

species is known also from a few places in high mountains of the interior of Alaska and Yukon Territory.

G. ALEUTICA Cham. & Schlecht. *G. unalaccensis* Bunge; ? *G. arctophila* var. β Griseb. in Hook. Fl. Bor.-Am. **2**: 61 (1840).—ALASKA RANGE: Nenana Valley, Healy, No. 367; Richardson Highw., between Summit and McCarty, No. 439; near Castner Glacier, No. 503-A.

The above numbers cannot satisfactorily be placed with *G. propinqua* nor with *G. arctophila* and are with some doubt referred to the above species, of which the writer has seen no authentic material. Our specimens differ from *G. propinqua* by their stout and somewhat undulate, yellowish-brown primary stem, by the large, 3-nerved and somewhat connate cauline leaves. The flowers are small, with a prominent calyx the lobes of which almost equal the tube of the corolla; the latter is pale blue, turning yellow when dry. The lobes are long-acuminate and without a crown.

The following numbers are intermediate between the above and *G. propinqua*, but because of their leafy stems, long calyx-lobes and pale bluish-yellow corollas are retained here. ALASKA RANGE: Richardson Highw., Castner Glacier, No. 503. KOKRINES MTS.: alluvial banks, No. 681. NORTON SD.: willow thickets, Pastolik, No. 1015. SEWARD PEN.: south coast, Bluff, dense, many-stemmed specimens from bird cliff, No. 1269.

G. ARCTOPHILA Griseb. in Hook. Fl. Bor.-Am. **2**: 61, tab. 149 (1840); Holm & Macoun in Rep. Can. Arct. Exp. **5**A: 19 (1921) in part, excl. tab. 11, fig. 1.—HEAD OF CHITINA R.: *H. M. Laing*, No. 175.

The above well matches Grisebach's description (l. c.) and his beautiful plate, as well as large series in the writer's collection from the arctic coast of Canada near the type locality.

G. GLAUCA Pall.—ALASKA RANGE: Broad Pass, No. 87; Richardson Highw., between Paxon and Summit, No. 560; Paxon, No. 585. KOKRINES MTS.: divide towards Melozitna R., No. 791. SEWARD PEN.: south coast, Nome, Anvil Hill, No. 1387; north coast, Buckland R., Clem Mt., No. 1616. Common in moist, alpine slopes, perhaps throughout the region, north to Wainwright Inlet (Seemann) and east through mountains of Yukon to the mouth of the Mackenzie.

One of the earliest flowering gentians of the region. No. 791 had flowers and almost mature fruit towards the end of June.

G. PROCERA Holm, in Ott. Naturalist, **15**: 179, tab. 12, figs. 3, 4 & 5 (1901).—ALASKA RANGE: Richardson Highw., between Summit and McCarty, in rich alluvial soil in open aspen woods, No. 440.

New to the flora of Alaska. The large series of specimens in the above collection well match the description of *G. procera* as well as the type (near Sarnia, Ont. September 9, 1892, *C. K. Dodge*, No. 11.793 Can), except that the calyx is perfectly glabrous. This character, however, appears to be rather variable in the section *Crossopetalum*, particularly in its western members. Our specimens appear to be biennial; the cauline leaves are narrow, the calyx-lobes unequal, the stigma broad, almost sessile, and the seeds dark brown, densely covered with short, rounded or obtuse papillae.

Our No. 440 well matches collections from Yukon Territory, Ranch Valley, *Gorman*, No. 1081 and Carmacks, *Eastwood*, No. 567 (both Can) as well as some collected in the Wood Buffalo Pk. of Northern Alberta, *H. M. Raup*, Nos. 3026–28, cited by him in Bull. Nat. Mus. Can. **74**: 157 (1935) and tentatively placed with *G. elegans*. That species, in addition to being strictly annual, has obtuse, broadly spathulate cauline leaves, equal calyx-lobes, the sinuses of which are obscurely fringed with hairs, and a style nearly as long as the capsule. Thus far *G. procera* has been known only from the Great Lake region and Stony Mt., Man.

G. propinqua Richards.—Head of Chitina R.: *H. M. Laing*, Nos. 174, 176 and 234. Norton Sd.: sea-shore near Qiqertariaq, No. 1094. Seward Pen.: south shore, Bluff, No. 1270; Nome, Anvil Hill, Nos. 1384 & 1385.

The above numbers have simple or sub-simple slender stems and very short calyx; they well match specimens in the writer's collection from near the type locality in N. W. Mackenzie.

G. prostrata Haenke.—Alaska Range: Nenana Valley, Lignite, No. 312; Healy, No. 368; Richardson Highw., between Summit and McCarty, No. 441. Head of Chitina R.: elevation 5,500 ft., *H. M. Laing*, No. 235 (a form with bifid corolla-lobes). Norton Sd.: dry tundra ridges, Pastolik, No. 1016. Seward Pen.: south coast, Bluff, No. 1268; Nome, *Thornton*, No. 301 (T); Port Clarence, No. 1447. Occasional on moist, alpine slopes of central Alaska and the Yukon Territory; apparently common on dry ridges in lowland tundra of the Bering Sea region north to Kotzebue Sd.

G. tenella Rottb.—Norton Sd.: in brackish meadows bordering lagoon, Unalaklet, No. 1115. Seward Pen.: Port Clarence, No. 1448. Rare or occasional in brackish meadows of the Bering Sea region, north to Kotzebue Sd.

Lomatogonium rotatum (L.) Fries. See Fernald in Rhodora, **21**: 193 (1919).—Norton Sd.: brackish margins of lagoon, Qiqertariaq, No. 1093. Seward Pen.: Nome, wet, brackish meadows by Snake R.,

No. 1388; Port Clarence, No. 1448-A. Apparently common in brackish meadows of the Bering Sea region, north to Kotzebue Sd.

SWERTIA PERENNIS L. var. OBTUSA (Ledeb.) Griseb.—ALASKA RANGE: in wet moss by a mountain brook, Paxon, south of the divide, collected in flower on June 29, No. 592.

Our material differs from the Eurasian *S. perennis* by the broadly obovate-oblong leaves and by the long and erect fringes around the nectar-glands. *Swertia* in Alaska belongs to the Pacific slope flora, and in the Alaska Range apparently does not cross the divide. Previously known only from the Pacific coast.

MENYANTHES TRIFOLIATA L.—ALASKA RANGE: Richardson Highw., margin of shallow lake, between Paxon and Summit, No. 561. HEAD OF CHITINA R.: elevation 2000 ft., *H. M. Laing*, No. 173. KOKRINES MTS.: small lake in river valley, flowering and fruiting, June 23, No. 790. NORTON SD.: hills back of Unalaklet, margin of small lake, No. 1162. SEWARD PEN.: north coast, Buckland R., No. 1617. Common in marshy places, margins of shallow lakes etc., throughout the region; in mountains of the interior almost to the timber line.

In the Bering Sea region not previously recorded from north of the Aleuts.

According to Fernald in RHODORA, **31**: 195 ff. (1929), the plant of Eastern North America is var. *minor* Michx., which is said to differ in a few minor characters from that of the Pacific coast, Alaska and also of Eurasia. The writer is unable to detect any difference between his material of *Menyanthes* from Alaska and the Mackenzie district, except that in Alaska *Menyanthes* flowers and fruits much earlier than in the latter place. No. 790 from central Alaska had mature fruit the last part of June whereas on Great Bear Lake, climatically comparable with the Kokrines Mountains, *Menyanthes* flowers in July and apparently does not mature fruit except in favorable seasons.

PHLOX SIBIRICA L.—NORTON SD.: volcanic hills back of Pastolik, No. 926. SEWARD PEN.: south coast, Bluff, No. 1279; Nome, Anvil Hill, No. 1397. Common on gravelly mountain slopes of the Bering Sea region, north to Cape Lisburne.

POLEMONIUM ACUTIFLORUM Willd.—FAIRBANKS: College, No. 242. ALASKA RANGE: Mountains between Healy and Moody creeks, No. 272. KOKRINES MTS.: divide towards Melozitna R., No. 793. YUKON DELTA: Kotlik, Nos. 884 and 885. SEWARD PEN.: Nome, *Thornton*, No. 381 (T); Port Clarence, No. 1449. DIOMEDE ISL.: Nos. 1720 and 1721. Common in moist, grassy places.

In the Bering Sea region *P. acutiflorum* flowers late in the season and in some years does not mature seed.

P. HUMILE Willd.—HEAD OF CHITINA R.: *H. M. Laing*, No. 117.
P. PULCHERRIMUM Hook.—SEWARD PEN.: north coast, Buckland R., No. 1620. The above, which with some doubt is referred to this species, is a perfect match for specimens from Bear Lake, N. W. T. (*A. E. & R. T. Porsild*, No. 3511).

Our plant is 30–40 cm. tall, with freely branching and very leafy stems from a creeping rhizome. The stem and calyx are viscid. The funnel-shaped flowers are almost as large as in *P. acutiflorum*, but the lobes of the corolla are not ciliate and the seeds are wingless. The flowers are much larger than in typical *P. pulcherrimum*.

LAPPULA REDOWSKII (Hornem.) Greene var. OCCIDENTALIS (Wats.) Rydb.—HEAD OF CHITINA R.: *H. M. Laing*, No. 182.

In Alaska previously known from Ft. Yukon (Rothr.).

ERITRICHIUM ARETIOIDES (Cham. & Schl.) DC.; Seemann, Bot. Herald Voy. 37, tab. 8 (1852).—SEWARD PEN.: south coast, Bluff, No. 1282; Nome, Anvil Hill, No. 1392; *Thornton*, Nos. 149 & 483 (T). Rare or occasional on gravelly mountain slopes of the Bering Sea region, north to Cape Lisburne.

Also known from mountains of northern Yukon Territory and the arctic coast west of Mackenzie (*D. D. Cairnes*, No. 83.066; *A. E. Porsild*, No. 7159). Our specimens well match Seemann's excellent plate.

MYOSOTIS ALPESTRIS Schm. var. ASIATICA Vestergr.—ALASKA RANGE: Richardson Highw., between Paxon and Summit, No. 564. HEAD OF CHITINA R.: *H. M. Laing*, No. 181. KOKRINES MTS.: divide towards Melozitna R., No. 794. SEWARD PEN.: south coast, Bluff, No. 1281; Nome, No. 1391. Fairly common in moist alpine meadows, north to Kotzebue Sd., and east through the mountains of Yukon to the arctic coast near the Mackenzie delta.

AMSINCKIA ? MENZIESII (Lehm.) Nels. & McBride.—SEWARD PEN.: Nome, *Thornton*, No. 131 (T). No doubt introduced.

MERTENSIA EASTWOODAE McBride in Contr. Gray Herb. (new ser.) **49**: 18 (1917). *M. Alaskana* Eastw. in Bot. Gaz. **33**: 287 (1902), non Britt.—KOKRINES MTS.: divide towards Melozitna R., in damp, cold spruce woods, flowering specimens on June 23, No. 792.

Our specimens well match the description as well as specimens from the type locality (Cape Nome, *Blaisdell* (NY)).

M. MARITIMA (L.) S. F. Gray.—NORTON SD.: St. Michaels, No. 1029; same place No. 1030 (f. ALBIFLORA Fern.); Qiqertariaq, No. 1095. SEWARD PEN.: Nome, *Thornton*, No. 411 (T). Common on sandy beaches along the Bering Sea shores.

M. PANICULATA (Ait.) G. Don.—FAIRBANKS: in a dry muskeg, with flowers and immature fruit on June 14, No. 204. ALASKA RANGE:

Broad Pass, flowering June 8, No. 88. HEAD OF CHITINA R.: dry burn, 2500 feet, *H. M. Laing*, No. 179; same place, 3500 feet, *idem*, Nos. 178 and 180 (the last a white-flowered form). LOWER YUKON: Anvik, *Mrs. Chapman*, No. 69 (NY). NORTON SD.: Unalaklet, *Palmer & Johnston*, No. 24 (NY). SEWARD PEN.: Nome, Anvil Hill, No. 1390; north coast, Kiwalik, No. 1482. A common and very early-flowering species throughout the region, in open spruce woods and willow thickets, north to Kotzebue Sd., east through the mountains of Yukon to the Mackenzie delta.

M. PANICULATA (Ait.) G. Don var. ALASKANA (Britt.) L. O. Williams in Ann. Mo. Bot. Gard. **24**, 1: 48 (1937). *M. Alaskana* Britt. in Bull. N. Y. Bot. Gard. **2**: 181 (1901).

In addition to the TYPE (Ft. Yukon, *A. Soule*, 1865 (NY)) the writer has seen a number of sheets all from mountains of the Yukon Territory and N. W. Mackenzie. The variety appears to be an endemic of this region.

SCUTELLARIA EPILOBIIFOLIA A. Ham. *S. galericulata* of Am. auth. not L.; see Fern. in RHODORA, **23**: 86 (1921).—FAIRBANKS: Smith Lake, No. 601. TANANA R.: Hot Springs, No. 648.

Apparently not previously known from north of the Pacific coast.

STACHYS PALUSTRIS L. var. HOMOTRICHA Fern. in RHODORA, **10**: 85 (1908).—TANANA R.: Hot Springs, No. 647.

Apparently new to the flora of Alaska.

MENTHA CANADENSIS L.—YUKON R.: Kokrines, No. 629. Common on riverbanks along the Yukon, at least to Holy Cross.

MIMULUS GUTTATUS DC.—TANANA R.: Hot Springs, No. 649. In wet moss by a brook.

Not previously known from north of the Pacific coast and the Aleuts.

PENSTEMON ? PROCERUS Dougl.—SEWARD PEN.: Nome, *Thornton*, No. 201 (T).

A low, herbaceous *Penstemon* with verticillate inflorescence of purplish-blue flowers.

VERONICA WORMSKJOLDII R. & S.; *V. alpina* var. *unalaschkensis* Cham. & Schlecht.—ALASKA RANGE: Richardson Highw., Castner Glacier, No. 505; between Paxon and Summit, No. 565; Paxon, No. 586. SEWARD PEN.: Nome, No. 1393. Rare or occasional on moist, grassy slopes of the Alaska Range; rare in the Bering Sea region north of the Yukon Delta.

V. AMERICANA Schweinitz.—TANANA R.: Hot Springs, No. 657. Near a recently abandoned settlement.

LAGOTIS STELLERI (Cham. & Schlecht.) Rupr.—NORTON SD.: volcanic hills back of Pastolik, dry gravelly ridges, No. 922. SEWARD

Pen.: south coast, Bluff, No. 1299; Nome, *Thornton*, Nos. 35 and 304 (T).

In No. 922 the style considerably exceeds the middle lobe of the corolla, the anthers are large and the filaments attached above the insertion of the middle lobe; the seeds are 7–8 mm. long.

Hultén, Fl. Kamtch. **4**: 104 (1930), illustrates the differences between the closely related *L. glauca* and *L. Stelleri*. According to him the distinguishing characters are chiefly found in the place of attachment of filaments and in the relative length of the filaments and style. From examination of living specimens it appears that in the plant of our area the flowers are proterandrous and that a considerable elongation takes place during anthesis, first of the filaments and later of the style. Also the length of the seed in the dozen samples examined shows variations from 4.5 to 8 mm. Our specimens match material from the Ural and the north coast of Siberia. When first expanded the corolla is bright sky-blue but soon fades. The flowers are without scent.

L. Stelleri is rare or occasional on moist alpine slopes of the Bering Sea region, north along the arctic coast of Alaska to the Mackenzie and in high mountains of the Yukon Territory.

Castilleja hyperborea Pennell in Proc. Acad. Nat. Sci. Phil. **86**: 532 (1934).—Head of Chitina R.: on dry slopes, 4500 feet elevation, *H. M. Laing*, No. 183. Seward Pen.: south coast, Bluff, on a dry mountain slope, No. 1277.

The type of *C. hyperborea* came from Sheenjek R., a tributary to the Porcupine, *J. B. Mertie* (US). To the notes on distribution given by Pennell, l. c., may be added that the species appears to be fairly common, in calcareous soil, on high mountains of Yukon and Alaska, north to Richardson Mts. west of the Mackenzie delta, south to Chitina R. near the 61st parallel, east to Campbell L. east of the Mackenzie Delta and west to Seward Peninsula.

Castilleja hyperborea seems abundantly distinct from all other northern members of the genus. The free part of the calyx is very prominent, with lobes almost equalling the corolla; the lobes are broad, somewhat spathulate, with a shallow notch at the tip forming two very short, obtuse, well rounded lobes. The anterior lip of the corolla is small, about three-fourths the length of the narrow galea. The bracts are large, lanceolate in outline, deeply lacerated, with from 5 to 7 narrow lobes, like the calyx and corolla yellow, drying

green, and towards maturity assuming a deep, bluish-black and most conspicuous tint (indigoticus).

C. PALLIDA (L.) Spreng.

After much time spent studying his rather copious material in *Castilleja*, from Alaska and arctic Canada, the writer, at length, decided entirely to follow Pennell's recent treatment of the Castillejas of northwestern North America. In the course of the study it became overwhelmingly clear to him that the genus, which even in the far north is complex, nevertheless, as shown by Pennell, is capable of hairfine division into small, but apparently distinct and constant species or subspecies. Whether or not the subdivision of *C. pallida*, as done by Pennell, is justified the writer cannot decide because of lack of material for comparison. Whereas the subspecies *caudata*, and possibly also ssp. *Mexiae*, seem abundantly distinct, perhaps even worthy of specific rank, the writer, with the complications arising from more abundant material, is somewhat in doubt about the distribution and segregation of ssp. *typica* and ssp. *elegans*. Thus the writer has seen no plants in Alaska that match typical ssp. *elegans* from arctic Canada. It seems abundantly clear, however, that only study of live material in the field can solve these problems.

C. PALLIDA (L.) Spreng. ssp. CAUDATA Pennell in Proc. Acad. Nat. Sci. Phil. **86**: 524 (1934). ? *C. occidentalis* Torr. in Ann. Lyc. N. Y. **2**: 230 (1828); *C. pallida* var. *occidentalis* Gray, Syn. Fl. **2**, 1: 297 (1886); Ostenf. Kria. Vidensk. Selsk. Skr. **8**: 64 (1909) sub *C. pallida* (L.) "HBK."—ALASKA RANGE: Richardson Highw., between Paxon and Summit, moist alpine slopes 2000–3000 ft., No. 566. KOKRINES MTS.: divide towards Melozitna R., moist alpine tundra, No. 799. NORTON SD.: volcanic hills back of Pastolik, No. 923.

The pale and late-flowering ssp. *caudata* superficially resembles *C. septentrionalis* of eastern North America, from which, however, it is amply distinct. It is an arctic-alpine plant of high mountains in Alaska and Yukon, reaching north to the Arctic Ocean, near the delta of the Mackenzie. Numerous entries in the writer's field notes emphasize that "the pale phase of *C. pallida*" always forms pure clumps without transitions to "the purple-flowered phase."

C. PALLIDA (L.) Spreng. ssp. ELEGANS (Ostenf.) Pennell in Proc. Acad. Nat. Sci. Phil. **86**: 526 (1934). *C. elegans* Ostenf. in Malte, in RHODORA, **36**: 187 (1934); *C. pallida* (L.) Spreng. var. *unalaschkensis* Ostenf. Kria. Vidensk. Selsk. Skr. **8**: 64 (1909), not Cham. & Schlecht. —KOKRINES MTS.: divide towards Melozitna R., alpine tundra, No. 800; ibidem, No. 801.

Both numbers differ considerably from authentic specimens of ssp. *elegans* from arctic Canada. In No. 800 the stem and leaves are glabrous, and the latter rather prominently 3-nerved, the upper with 2–3 pairs of long, narrow lobes. Inflorescence densely white-woolly; the bracts ample, laciniate; calyx-lobes deeply notched and the anterior lip of the corolla two-fifths the length of galea; corolla purple, drying black. In No. 801 the leaves are entire, and, like the stem, purplish and puberulent.

C. PALLIDA (L.) Spreng. ssp. MEXIAE (Eastw.) Pennell, Proc. Acad. Nat. Sci. Phil. **86**: 526 (1934).—ALASKA RANGE: Healy, west side of Nenana Valley, open woods and river flats, No. 369.

The above matches the description of ssp. *Mexiae*, the type of which came from Mt. McKinley Park, not far from Healy. Our specimen is that of a young plant which flowers for the first time.

C. PALLIDA (L.) Spreng. ssp. TYPICA Pennell, Proc. Acad. Nat. Sci. Phil. **86**: 522 (1934).—SEWARD PEN.: Nome, Anvil Hill, dry herb-mats, No. 1394.

Because of the deeply divided and narrow calyx-lobes, the nonsaccate anterior lip of the corolla half as long as the narrow galea, the above clearly belongs in *C. pallida*, and, following Pennell, is best placed with the ssp. *typica*.

EUPHRASIA MOLLIS (Ledeb.) Wettst.—NORTON SD.: Pastolik, No. 1019. Locally abundant, growing on the sides of large *Eriophorum vaginatum* tussocks.

The above, with some doubt, is referred to *E. mollis*. The leaves are smaller than in that species, but, like the simple stems, very hirsute. The corolla is yellow, the upper lip boat-shaped, barely notched.

E. DISJUNCTA Fern. & Wieg. in RHODORA, **17**: 190 (1915). –HEAD OF CHITINA R.: 2000 ft. elev., *H. M. Laing*, No. 237 SEWARD PEN.: south coast, Bluff, No. 1278.

Corolla yellow, upper lip not bilobed. See Hultén, Fl. Aleut. under *E. mollis*. No *Euphrasia* previously known from north of Pribilof Isl. and the Pacific coast.

RHINANTHUS GROENLANDICUS Chab.—SEWARD PEN.: south coast, Bluff, No. 1274.

Not previously reported from north of the Pacific coast and the Aleuts.

PEDICULARIS CAPITATA Adams.—ALASKA RANGE: Broad Pass, No. 92; mountains between Healy and Moody creeks, No. 271. HEAD

of Chitina R.: *H. M. Laing*, Nos. 185–187. Seward Pen.: Nome, *Thornton*, Nos. 64, 333 and 337 (T). Occasional on high mountains of the interior, apparently rare or local on mountains of Seward Pen.

P. flammea L.—Seward Pen.: north coast, Buckland R., No. 1625.

New to the flora of Alaska.

P. groenlandica Retz.—Alaska Range: Broad Pass, No. 90.

P. labradorica Wirsing. See Merrill in Rhodora, **40**: 292 (1938).

P. euphrasioides Steph.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 147; College, No. 239. Alaska Range: Broad Pass, No. 89. Head of Chitina R.: *H. M. Laing*, No. 184. Kokrines Mts.: divide towards Melozitna R., No. 796. Norton Sd.: hills back of Pastolik, No. 924. Seward Pen.: Nome, *Thornton*, No. 137 (T); north coast, Kiwalik R., No. 1483; Buckland R., No. 1623. Common in heaths and muskegs throughout the region, north at least to Kotzebue Sd.

P. lanata Cham. & Schlecht.—Alaska Range: Broad Pass, No. 91. Seward Pen.: north coast, Buckland R., No. 1624. Rare or occasional in wet tundra.

New to the flora of the interior of Alaska. Records of *P. hirsuta* from Alaska (Seem., Kjellm. and Eastw.) no doubt refer to *P. lanata.*

P. Langsdorffii Fisch. ex Stev. Monogr. Pedic. 49 (1822).—Alaska Range: Broad Pass, Nos. 90-A and 91-A; Nenana Valley, Healy, No. 370. Seward Pen.: Nome, *Thornton*, No. 339 (T).

New to the interior of Alaska, rare in the Bering Sea region north of the Pribilof Islands.

P. Oederi Vahl.—Seward Pen.: Nome, *Thornton*, Nos. 335 and 433 (T). Known also from Kotzebue Sd. and from the interior.

P. Pennellii Hultén, Fl. Aleut. 300, tab. 14 (1937). *P. palustris* sensu auctt. quoad pl. Al. non Sm.—Seward Pen.: south coast, Bluff, No. 1275; Nome, *Thornton*, No. 338 (T).

Previously known from Alaska Pen. and Norton Sd. (Hultén).

P. sudetica Willd.—Fairbanks: in a muskeg, No. 205; College, No. 238. Alaska Range: Nenana Valley, Lignite, No. 313; Richardson Highw., between Summit and McCarty, No. 444. Kokrines Mts.: divide towards Melozitna R., No. 798. Yukon Delta: Kotlik, No. 883. Seward Pen.: Nome, *Thornton*, No. 342 (T); north coast, Buckland R., Nos. 1622 and 1626. Common in wet tundra throughout the region.

P. verticillata L.—Alaska Range: Richardson Highw., Paxon, No. 587. Head of Chitina R.: *H. M. Laing*, No. 237. Kokrines Mts.: near sulphur springs, No. 682; divide towards Melozitna R., Nos. 795 and 797. Norton Sd.: hills back of Qiqertariaq, No. 1066. Seward Pen.: south coast, Bluff, No. 1276; Nome, Nos. 1395 and

1396. Rare or occasional throughout the region, north to Kotzebue Sd.; in the interior limited to high mountains.

BOSCHNIAKIA ROSSICA (Cham. & Schlecht.) B. Fedtsch.—ALASKA RANGE: Nenana Valley, Healy, No. 371; Richardson Highw., between Summit and McCarty, No. 445. HEAD OF CHITINA R.: *H. M. Laing*, No. 180. YUKON R.: Birches, No. 612. NORTON SD.: hills back of Pastolik, No. 925; hills back of Unalaklet, No. 1163. SEWARD PEN.: Nome, *Thornton*, July 31, 1920 (T); north coast, Buckland R., No. 1627. Common in open forests, alder thickets and in luxuriant, not too wet muskegs, north to Kotzebue Sd.

Most often parasitic on the roots of *Alnus crispa* and *Picea glauca*, but occasionally found also on *Salix reticulata* and on *Chamaedaphne calyculata*. Also known from central Yukon and N. W. T. east to 110° W. and on the Mackenzie River north to the arctic coast.

PINGUICULA VILLOSA L.—ALASKA RANGE: Broad Pass, flowering specimens on June 8th, No. 93; mountains between Healy and Moody creeks, No. 270. KOKRINES MTS.: divide towards Melozitna R., No. 787. SEWARD PEN.: north coast, Buckland R., No. 1614.

A common species throughout the region, north at least to Kotzebue Sd.; in the interior perhaps chiefly in the mountains. *P. villosa* always grows in pure *Sphagnum sp.* in rather wet muskegs and tundra bogs; it flowers in June, soon after the snow disappears. The diminutive leaves are completely hidden in the *Sphagnum* and when past flowering the plant is extremely hard to see and, for this reason, it is, no doubt, often overlooked.

P. VULGARIS L. *P. arctica* Eastw. in Bot. Gaz. **33**: 293 (1902).—ALASKA RANGE: Nenana Valley, Healy, No. 366; Richardson Highw., between Summit and McCarty, No. 442. SEWARD PEN.: south coast, Bluff, No. 1271; Nome, *Thornton*, No. 18 (T). Rare or occasional in wet, springy places on calcareous soil throughout the region.

UTRICULARIA INTERMEDIA Hayne.—KOKRINES MTS.: divide towards Melozitna R., No. 787-A. SEWARD PEN.: Port Clarence, Can. Arct. Exp. No. 560; north coast, Buckland R., No. 1612.

The material shows well developed, but sterile specimens with large winter buds. Rare or occasional in shallow ponds and wet *Carex* bogs. New to the flora of Alaska.

U. VULGARIS L. var. AMERICANA Gray. *U. macrorhiza* LeConte.—FAIRBANKS: Smith Lake, No. 600. NORTON SD.: Pastolik, No. 1009. SEWARD PEN.: north coast, Buckland R., No. 1613.

The first two numbers are in anthesis, the last is sterile but has large winter buds. Probably common in shallow lakes and ponds of the lowland throughout the region, north to Kotzebue Sd. The

Alaska plant belongs to the American race, var. *americana*, which apparently is distinct from the Eurasian plant by its consistently longer and more slender spur.

PLANTAGO JUNCOIDES Lam. var. TYPICA Fern. in RHODORA, **27**: 99 (1925).—NORTON SD.: Qiqertariaq, No. 1096. Common in brackish meadows of the Bering Sea shores, north to Kotzebue Sd.

Previously known from the Aleuts and the Pacific coast.

PLANTAGO MAJOR L. var. ASIATICA (L.) Dcne.—YUKON R.: Kokrines, No. 628. Very common in alluvial soil along the Yukon, where it, no doubt, is indigenous.

Apparently new to the flora of Alaska.

GALIUM BOREALE L.—FAIRBANKS: College, No. 240. ALASKA RANGE: Richardson Highw., between Summit and McCarty, No. 443. TANANA R.: Hot Springs, No. 651. YUKON R.: Birches, No. 611. KOKRINES MTS.: divide towards Melozitna R., No. 789. NORTON SD.: Pastolik, No. 1018. SEWARD PEN.: south coast, Bluff, No. 1273; Nome, *Thornton*, Nos. 8 and 499-C (T); north coast, Kiwalik, Nos. 1480 and 1481; Buckland R., No. 1619. Very common in dry, lowland woods of the interior; rare or occasional on dry, grassy slopes of the Bering Sea region, north to Kotzebue Sd.

G. BRANDEGEI Gray.—FAIRBANKS: wet places in muskeg, No. 210. YUKON DELTA: Kotlik, brackish meadows, No. 882. NORTON SD.: low, wet tundra, Pastolik, No. 1017; Qiqertariaq, No. 1092; Unalaklet, wet meadows, No. 1116. SEWARD PEN.: Nome, brackish meadow near Snake R., No. 1398; north coast, Buckland R., No. 1618. A common species in wet, often brackish meadows, *Carex* and *Sphagnum* bogs of the lowland throughout the region, north to Kotzebue Sd.

In Nos. 882 and 1017 a faint kumarin scent was noticed in drying. *G. Brandegei* appears to be the most northern member of the genus, ranging north beyond the limit of trees, from Greenland to Bering Strait. Not previously recorded from Alaska.

G. TINCTORIUM L. var. SUBBIFLORUM (Wieg.) Fernald in RHODORA, **39**: 320 (1937). See also RHODORA, **37**: 443–445 (1935).—YUKON R.: Holy Cross, in a wet cow pasture, No. 833.

In the above material the long, trailing stems are scabrous; the leaves are rough along the margins and the pedicels short and rather stout. New to the flora of Alaska.

G. TRIFIDUM L.—FAIRBANKS: Smith Lake, in wet *Carex* bog, No. 602. In our region a southern woodland species.

Previously known only from the Aleuts and the Pacific Coast.

G. TRIFLORUM Michx.—ALASKA RANGE: Richardson Highw., Castner Glacier, locally abundant on fertile slopes and in willow

thickets, 2000 feet elevation, No. 504. Tanana R.: Hot Springs, in rich woods, No. 650. A southern woodland species.

Previously known only from the Aleuts and the Pacific coast.

Viburnum pauciflorum Raf.—Fairbanks: in willow thickets, No. 193. Head of Chitina R.: *H. M. Laing*, Nos. 191–193. Seward Pen.: Nome, *Thornton*, No. 122 (T).

New to the flora of central and N. W. Alaska.

Linnaea borealis L. var. americana (Forbes) Rehd.—Fairbanks: College, No. 237. Kokrines Mts.: divide towards Melozitna R., No. 788. Head of Chitina R.: *H. M. Laing*, Nos. 189–190. Seward Pen.: Nome, No. 1399. A common species of dry open woods throughout the region, in the Bering Sea region north to Kotzebue Sd., but becoming rare beyond the limit of trees.

Hultén, Fl. Aleutian Isl. p. 310, suggests that in Alaska the plant found west of 152° long. belongs to the Eurasian race. The writer doubts the correctness of this statement; at any rate, all *Linnaea* seen in the region visited by him belong to var. *americana*.

Adoxa Moschatellina L.—Alaska Range: Broad Pass, very rare, in wet, springy place by a brook, No. 60-A. Yukon R.: Anvik, Mission premises, June 15, 1907, *J. W. Chapman* (G).

Not previously recorded from Alaska.

Valeriana capitata Pall.—Fairbanks: in a *Picea* swamp, No. 206; College, No. 241. Alaska Range: Broad Pass, No. 94. Seward Pen.: Nome, No. 1400; north coast, Buckland R., No. 1621. Diomede Isl.: No. 1719. Common in wet, springy places throughout the region, north to the arctic coast.

Campanula lasiocarpa Cham.—Alaska Range: Nenana Valley, Lignite, No. 314; Healy, No. 372; Richardson Highw., Castner Glacier, No. 506. Kokrines Mts.: divide towards Melozitna R., No. 802. Norton Sd.: hills back of Pastolik, No. 927; hills back of Unalaklet, No. 1164. Seward Pen.: Nome, Anvil Hill, No. 1401; north coast, Buckland R., Clem Mt., No. 1628. Rare or occasional on gravelly mountain slopes throughout the region.

C. rotundifolia L.—Seward Pen.: Nome, *Thornton*, No. 332 (T).

Not seen by us; apparently absent from the interior and northern Alaska, Yukon Territory and N. W. Canada.

C. uniflora L.—Alaska Range: Nenana Valley, Healy, No. 373. Kokrines Mts.: divide towards Melozitna R., No. 803. Norton Sd.: hills back of Pastolik, No. 928; Pastolik, dry peaty tundra ridges, No. 1020; hills back of Unalaklet, No. 1165. Seward Pen.: south coast, Bluff, No. 1280; Nome, *Thornton*, No. 126 (T). Occasional on gravelly mountain slopes of the Bering Sea region. One or two stations in mountains of the interior.

Solidago lepida DC. var. elongata (Nutt.) Fern.—Tanana R.: Hot Springs, open woods and riverbanks, No. 654.

Our specimens are young. The stem is softly pubescent, the leaves are puberulent, long-acuminate, remotely, but sharply dentate. Not previously known north of the Pacific coast.

S. multiradiata Ait.—Alaska Range: Richardson Highw., sandy riverbank, Castner Glacier, No. 509; same place, on alpine slope, No. 510; Paxon, moist alpine slope, No. 588. Head of Chitina R.: dry hillsides, 2500 feet, flowering specimens, June 21, *H. M. Laing*, No. 196; fruiting specimens, July 14, *idem*, No. 195. Kokrines Mts.: divide towards Melozitna R., Nos. 811–812. A common species of dry mountain slopes of the interior.

S. multiradiata Ait. var. arctica (DC.) Fern.—Norton Sd.: Pastolik, in willow thickets, Nos. 1024 and 1024-A; hills back of Unalaklet, No. 1169. Seward Pen.: south coast, Bluff, No. 1295; Port Clarence, No. 1450.

In Alaska the var. *arctica* appears to be limited to the Bering Sea region and previous records of *S. multiradiata* or *S. Virgaurea* probably belong here.

Aster junceus Ait.—Fairbanks: Goldstream Cr. and Pedro Dome, No. 154.

The material is immature but most closely matches the above species.

A. sibiricus L.—Alaska Range: Richardson Highw., Castner Glacier, No. 511. Head of Chitina R.: *H. M. Laing*, No. 194. Yukon R.: Kokrines, riverbanks, No. 630. Kokrines Mts.: No. 683. Norton Sd.: Pastolik, No. 1022; hills back of Unalaklet, No. 1168. Seward Pen.: south coast, Bluff, No. 1289; Nome, *Thornton*, Nos. 66 and 196 (T); north coast, Kiwalik R., No. 1485. Common throughout the region in sandy places such as river banks and flats, dunes etc.

Erigeron acris L. var. asteroides (Andrz.) DC.—Alaska Range: Richardson Highw., Castner Glacier, No. 513. Kokrines Mts.: divide towards Melozitna R., No. 804. Common locally in mountains of the interior, on calcareous soil.

E. compositus Pursh.—Head of Chitina R.: between 3500 and 4500 feet elevation, *H. M. Laing*, Nos. 197 and 198.

E. elatus Greene, Pitt. **3**: 164 (1897). *E. acris* L. var. *arcuans* Fern. See Fernald in Rhodora, **40**: 347 (1938).—Fairbanks: sandy poplar ridge, No. 208. Alaska Range: Nenana Valley, Lignite, in poplar woods by a small stream, No. 316. Rare or occasional in the interior, on calcareous soil.

Apparently new to the flora of Alaska.

E. eriocephalus J. Vahl.—Head of Chitina R.: elevation 6,000 feet, *H. M. Laing*, No. 241.

New to the flora of Alaska.

E. glabellus Nutt. var. pubescens Hook.—Alaska Range: Richardson Highw., between Summit and McCarty, No. 448.

New to the flora of Alaska.

E. grandiflorus Hook., Fl. Bor.-Am. **2**: 18, tab. 123 (1840).—Norton Sd.: hills back of Pastolik, No. 933. Seward Pen.: south coast, Bluff, No. 1287.

E. radicatus Hook. Fl. Bor.-Am. **2**: 17, tab. 122 (1840). *E. nanus* Nutt.—Alaska Range: Broad Pass, on dry, gravelly slopes, No. 99.

New to the flora of Alaska.

E. unalaschkensis (DC.) Vierh.—Alaska Range: Richardson Highw., Castner Glacier, No. 512; Between Paxon and Summit, No. 567. Seward Pen.: south coast, Bluff, No. 1288; Nome, No. 1407.

The above series have larger heads than typical *E. unalaschkensis*.

Antennaria alaskana Malte in Rhodora, **36**: 107 (1934).—Fairbanks: Goldstream Cr. and Pedro Dome, dry gravelly slope, 2000 feet, No. 148. Norton Sd.: hills back of Pastolik, No. 936; volcanic hills at Qiqertariaq, No. 1067; hills back of Unalaklet, No. 1170. Seward Pen.: Nome, Anvil Hill, No. 1404; north coast, Buckland R., Clem Mt., No. 1631. Common on volcanic gravels in the mountains of the Bering Sea region, rare or occasional on high mountains of the interior.

Antennaria alaskana has a short, but well developed stout rootstock but no stolon-like offsets; the narrowly spathulate, crowded, densely adpressed-canescent leaves have purplish-colored petioles. The flowering stems are rather stiff and dark brown under the floccose tomentum. The heads are small and, as a rule more or less peduncled, sometimes four and five, but mostly three together. The pappus is rather short and the achenes glabrous. It seems a very well marked species, abundantly distinct from *A. monocephala* and *A. nitens*. The type came from Port Clarence, *Walpole*, No. 1496 (G).

A. anaphaloides Rydb. in Mem. N. Y. Bot. Gard. **1**: 409 (1900).—Fairbanks: clay banks and poplar ridges in a muskeg east of town, No. 207.

New to the flora of Alaska.

A. isolepis Greene in Ott. Nat. **25**: 41 (1911); Fernald, Rhodora, **26**: 102, tab. 142, fig. 7 (1924); Malte, Rhodora, **36**: 108 (1934).—Fairbanks: Goldstream Cr. and Pedro Dome, No. 149. Alaska Range: Broad Pass, No. 103; Richardson Highw., between Summit

and McCarty, fertile, shaly slopes, No. 449; Castner Glacier, sandy banks of stream, No. 507; between Summit and Paxon, gravelly slope, No. 569. KOKRINES MTS.: divide towards Melozitna R., gravelly alpine slopes 3000 feet elev., No. 814. Common on dry mountain slopes of the interior.

The first two numbers are too young but most likely belong here. New to the flora of Alaska.

A. **Laingii,** n. sp. (TAB. 554, FIG. 11–13). Planta dense humifusa, stolonibus prostratis longis; foliis basilaribus numerosis linearispatulatis acuminatis 1.0–1.5 cm. longis 0.3 cm. latis utrinque dense canescente-tomentosis; caule florifero paullum crasso et rigido, parte superiore lanato, inferiore canescente 8–14 cm. alto; foliis caulinis 10–14 lineari-spatulatis, planis, acuminatis vel mucronatis, nunquam scarioso-appendiculatis; capitulis femineis 3–8 plerumque dense glomerulatis; bracteis exterioribus viridibus apice fusco-scariosis dense albido-lanatis, interioribus lanceolato-obtusis chartaceis eburneis; pappo tenuiter barbellato, non plumoso; acheneis glabris; planta mascula ignota.

Caespitose, matted, with long, stolon-like offsets; leaves of the rosettes numerous, 1.0 to 1.5 cm. long, about 0.3 cm. wide, linear-spathulate, acuminate, densely canescent-tomentose on both sides; stems rather stout and rigid, woolly above, canescent below, 8 to 14 cm. high, leafy with 10 to 14 well developed, flat, linear-spathulate leaves, these canescent with a dense even felt, acuminate or mucronate, but not at all scarious-tipped; pistillate heads 3 to 8 in dense glomerules; outer bracts green, with scarious brown tips, like the peduncles densely white-woolly; inner bracts lanceolate, obtuse, papery, ivory white; pappus finely barbellate, not plumose; achenes glabrous; staminate plant unknown.—HEAD OF CHITINA R.: dry hillsides in small clumps, 2100 feet elevation, June 13, 1925, *H. M. Laing*, No. 210 (TYPE); same place, sunny exposure, 2500 feet elevation, May 30, 1925, *idem*, No. 238. ALASKA RANGE: Mt. McKinley Nat. Park, 63° 43′ N. 149° 15′ W., *E. Scamman*, No. 677 (G).

Antennaria Laingii is named for its collector, Mr. HAMILTON M. LAING of Comox, British Columbia, who, by his collection of plants during the Mt. Logan Expedition to South East Alaska, made an important contribution from a botanically unknown region. By its dense matted growth, the very leafy stems and compact glomerulate ivory-white heads, it differs strikingly from all other boreal Antennarias. *A. Laingii* is perhaps most closely related to *A. arida* A. Nelson, described from southwestern Wyoming, but differs from this by its much stiffer and stouter stems and by the quite flat, not at all conduplicate or twisted, conspicuously mucronate leaves.

A. MONOCEPHALA DC., Prod. **6**: 269 (1837). *A. alpina* auctt. quoad pl. Alask. pro maxima parte; *A. exilis* Greene, Pitt. **3**: 288 (1898); Malte in RHODORA, **36**: 106 (1934); Hultén, Fl. Aleut. 319, tab. 15 above (1936).—HEAD OF CHITINA R.: 5500 ft. elevation, *H. M. Laing*, No. 239 (typical). SEWARD PEN.: Nome, Anvil Hill, No. 1405 (the specimens in the last number are not typical, perhaps *A. monocephala* × *philonipha*); Nome, *Thornton*, No. 52 (T).

A. **philonipha**, n. sp. (TAB. 554, FIG. 1–10). Planta dioica dense humifusa, stolonibus prostratis confertis 5–10 cm. longis, colonias parvas formans; foliis basilaribus spatulato-obovatis circa 1.5 cm. longis 0.4 cm. latis distincte mucronatis, supra glabratis, subtus adpresse sericeo-tomentosis aetate glabrescentibus; caulibus floriferis debilibus gracillimis praesertim supra, laxe floccoso-tomentosis, aetate glabrescentibus, femineis 10–14 cm. altis, masculis plerumque minus quam 10 cm. altis; foliis caulinis linearibus 5–10 valde reductis, apice appendicibus scariosis planis obtusis 2.0 mm. longis munitis; capitulis solitariis vel rarius 2–3, masculis parvis, juventute nutantibus, involucris circa 5.0 mm. altis, squamis obovatis plumbeis; pappo vix barbellato, apice paullo clavato; femineis majoribus involucris 6–7 mm. altis, squamis aequalibus tenuibus membranaceis acuminatis infra apicem umbrinis, juventute olivaceis, aetate pallide stramineis: pappo maturo rufidulo, scabro tantum, nullo modo plumoso; stylo exserto bifido; acheniis glabris.

Plant dioecious, matted, forming small colonies by stolon-like offsets 5 to 10 cm. long; basal leaves spathulate-obovate about 1.5 cm. long and 0.4 cm. wide, mucronate, glabrous above, appressed silky-tomentose beneath, becoming glabrate in age; stems very slender and weak, thinly floccose-tomentose, especially above, becoming glabrate in age, with 5 to 10 very reduced stem leaves tipped with a very conspicuous brown, flat, obtuse and scarious appendage 2.0 mm. long; stem of pistillate plant 10 to 14 cm. tall, that of the staminate as a rule less than 10 cm. high; heads solitary or very rarely 2 or 3 together, the staminate small, nodding when young, their involucres about 5.0 mm. high with obovate, lead-colored bracts; pappus scarcely barbellate, slightly thickened at the apex; pistillate heads somewhat larger, their involucres 6 to 7 mm. high, the bracts of equal length, thin and hyaline, acuminate, dark brown below the tips, olivaceous when young, becoming pale straw-colored in age; pappus rufidulous when mature, the rays merely scabrous, not at all plumose; style exserted, bilobed; achenes glabrous.—*A. philonipha* is an alpine species invariably found on snow-flushes, ranging from the Bering Sea region through mountains of Alaska and Yukon to the arctic coast east of Mackenzie. ALASKA RANGE: Richardson Highw., between Paxon and Summit, 2000 to 3000 ft. elev., No. 570; Paxon, south of divide, No. 590. MT. MCKINLEY NATIONAL PK.: 63° 43′ N., 149° 15′ W., *E. Scamman* (G). SEWARD PEN.: Nome, Anvil Hill, No. 1405-A. UNALASKA: mountain summits, August 22, 1891, *J. M. Macoun* (Can). YUKON TERRITORY:

ANTENNARIA PHILONIPHA, n. sp.: FIGS. 1–5, pistillate plants, and 6–8, staminate plants, × 2/5; FIG. 9, staminate head, × 5/3; FIG. 10, pistillate head, × 5/3; all from TYPE (Arctic coast, east of Mackenzie Delta, Northwest Territory, Canada).

ANTENNARIA LAINGII, n. sp.: FIGS 11 and 12, pistillate plants, × 2/5; FIG. 13, pistillate heads, × 5/3; all from TYPE (head of Chitina River, Alaska).

White Pass, *Eastwood*, No. 925 (Can) (the last two sub *A. monocephala*). NORTHWEST TERRITORY: Richardson Mts., west of Mackenzie delta, elevation 2000 ft., *A. E. Porsild*, Nos. 6861 and 6863; Caribou Hills, east of Mackenzie delta, *idem* No. 6553; Arctic Coast, east of Mackenzie, near Kittigazuit, in willow thickets, *A. E. & R. T. Porsild*, No. 2524 (TYPE).

Antennaria philonipha is nearest related to *A. monocephala* and where the two occur together intermediate forms or hybrids may be found. From the latter it may at once be distinguished by the thinner tomentum of the leaves, the elongated offsets, the tall and slender stems and by the larger pistillate heads. From *A. nitens* Greene, a very doubtful species described from Hudson Bay, it is distinguished by the elongated offsets and the tomentose stem.

A. SUBCANESCENS Ostf. in Malte in RHODORA, **36**: 112 (1934). *A. alpina* sensu Macoun & Holm in Rep. Can. Arct. Exp. **5**: 21A, tab. 12, fig. 3 (1921), non Gaertn.—ALASKA RANGE: Broad Pass, No. 102; mountains between Healy and Moody creeks, 4000 feet, No. 273.

Very closely related to *A. compacta* Malte, from which it is distinguished by narrowly obovate mucronate thinly tomentose leaves and the glabrate dark green stems and more acuminate involucral bracts. Like that species it has a short thick rhizome. The pappus is short, somewhat sordid and the achenes glabrous. New to the flora of Alaska.

ACHILLEA BOREALIS Bong.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, common on dry, shaly banks, No. 447. HEAD OF CHITINA R.: shaly slope, 4500 feet elevation, *H. M. Laing*, No. 240.

The specimens in the first number are 40 to 60 cm. high, with a much branched inflorescence with peduncles 4 to 10 cm. long, and very firm and compact glomerules. The margins of the involucral bracts vary from pale to dark brown. The specimens are a perfect match for some from Vancouver Island, B. C., labelled by Rydberg *A. fusca* Rydb. (Can).

Achillea borealis appears to be a southern, late-flowering species, in our region confined to the interior and to the Pacific coast; previously known from the latter area and from the Aleuts, north to Nunivak Isl., *J. M. Macoun*, No. 20.626 (Can).

A. MILLEFOLIUM L. var. NIGRESCENS E. Mey. *A. subalpina* Greene, Leaflets, **1**: 145 (1905).—HEAD OF CHITINA R.: elevation 2000 feet, *H. M. Laing*, No. 199.

A. SIBIRICA Ledeb. *A. multiflora* Hook. See Fern. in RHODORA,

31: 219 (1929).—Tanana R.: Hot Springs, No. 653. Common on alluvial banks of the Yukon and Tanana rivers, also in central Yukon, east to the Mackenzie delta (Porsild ined.).

Matricaria ambigua (Ledeb.) Kryl. Fl. Alt. **3**: 625 (1904). *Chrysanthemum grandiflorum* Hook. not Boiss. For discussion and complete synonymy see M. P. Porsild in Medd. om Grønl. **92**, 1: 72 (1932).—Seward Pen.: Nome, *Thornton*, No. 68 (T). Occasional on sea-shores of the Bering Sea region and the arctic coast.

Chrysanthemum integrifolium Richards.—Seward Pen.: south coast, Bluff, No. 1292; Nome, *Thornton*, Nos. 153, 188 and 316 (T). Occasional or rare on the Bering Sea shores and the arctic coast.

C. arcticum L.—Yukon Delta: Kotlik, No. 886. Norton Sd.: Unalaklet, No. 1119; Qiqertariaq, No. 1097. Seward Pen.: Nome, *Thornton*, Nos. 55, 202 and 394 (T). Diomede Isl.: No. 1726. Common in wet, brackish meadows along the Bering Sea shores, north along the arctic coast.

Tanacetum bipinnatum (L.) Schultz-Bip.—Yukon R.: Birches, river banks, No. 613. Yukon Valley: *L. M. Turner* (G); Ramparts, *J. A. Kusche*, 1916 (G). Kobuk R.: *L. J. Palmer*, No. 633. Lower Kuskokwim R., *Hinckley*, Aug. 1898 (G). Common throughout the interior of Alaska on sandy river banks.

Artemisia arctica Lessing in Linnaea **4**: 213 (1831). *A. norvegica* auth. not Fr.—Fairbanks: Goldstream Cr. and Pedro Dome, 2000 feet elev., No. 152. Kokrines Mts.: divide towards Melozitna R., No. 806. Seward Pen.: south coast, Bluff, No. 1283; Nome, *Thornton*, No. 15 (T); north coast, Buckland R., No. 1632. Diomede Isl.: No. 1723. Perhaps the most common member of the genus in arctic N. W. Alaska and on high mountains of the interior.

It most often grows on moist slopes and snow flushes. Towards maturity, the heads become sharply deflexed.

A. borealis Pall.—Diomede Isl.: No. 1722.

Apparently a rare species in Alaska; reported from Seward Pen. and Kotzebue Sd. (Kjellm., Seem.) but not seen by us.

A. globularia Cham. in Bess. Nouv. Mém. Soc. Nat. Mosc. **3**: 64 (1834).—Kokrines Mts.: divide towards Melozitna R., elev. 3000 feet, No. 815.

New to the interior of Alaska, but previously known from the Bering Sea region north to Cape Lisburne (Hultén).

A. hyperborea Rydb. in N. Am. Fl. **34**, 3: 262 (1916). *A. arctica* Bess. in Hook. Fl. Bor.-Am. **1**: 323 (1840), in part, not *A. arctica* Less.—Alaska Range: Nenana Valley, Healy, No. 374.

The above well matches material from arctic Canada.

A. senjavinensis Bess. in Nouv. Mém. Soc. Nat. Mosc. **3**: 65 (1834). *A. androsacea* Seem. Bot. Voy. Herald, 34 tab. 6. (1852).—

Seward Pen.: Nome, Anvil Hill, alpine slopes, No. 1406; *Thornton*, No. 152 (T). This rare plant is well illustrated by Seemann l. c.

A. spithamaea Pursh.—Yukon R.: just above delta, No. 840. Common along the Yukon R., in alluvial soil.

A. Tilesii Lædeb.—Alaska Range: Richardson Highw., Castner Glacier, on grassy slopes, No. 508. Seward Pen.: Nome, *Thornton*, Nos. 191 and 498 (T); north coast, Kiwalik R., No. 1484; Buckland R., No. 1633 (the last two are var. elatior T. &. G). Diomede Isl.: Nos. 1724 and 1725.

Very common in the Bering Sea region where it is one of the first perennials to pioneer on fresh soil, such as slumping river banks, mining dumps and cultivated land; and for this reason it is very abundant about human habitations, where, on manured soil, it grows 1.5 m. tall.

A. ? Tyrrellii Rydb. in N. Am. Fl. **34**, 3: 262 (1916).—Kokrines Mts.: divide towards Melozitna R., No. 805. Seward Pen.: south coast, Bluff, Nos. 1284–1286.

The above well matches Rydberg's description as well as the rather fragmentary specimen on which it is based: Northern B. C.: Selkirk Trail, Sept. 6, 1898, *J. B. Tyrrell*, No. 19.439 (Can). Our specimens all have fertile disc-flowers and long-peduncled, more or less globose heads, with brown-margined canescent-tomentose bracts. *A. Tyrrellii*, no doubt, is closely related to *A. hyperborea* from which it is easily distinguished by the dense, white, appressed tomentum, much thicker than in *A. hyperborea*, and by the lax, long-peduncled inflorescence.

Petasites frigidus (L.) Fries. *P. gracilis* Britt. in Bull. N. Y. Bot. Gard. **2**: 186 (1901).—Alaska Range: Broad Pass, in a wet muskeg, No. 101. Head of Chitina R.: wet places, elevation between 2500 and 3000 feet, *H. M. Laing*, Nos. 200 to 202. Yukon Delta: Kotlik, No. 887. Seward Pen.: Nome, *Thornton*, Nos. 71 and 491 (T). Diomede Isl.: No. 1729.

Apparently a western arctic-alpine species, common in the Bering Sea region, north along the arctic coast to Coronation Gulf and Melville Island; also in high mountains of the interior of Alaska and Yukon, south to mountains of Alberta and British Columbia.

Arnica attenuata Greene.[1]—Head of Chitina R.: elevation 3000 feet, *H. M. Laing*, Nos. 204 and 205. Although not previously reported from Alaska, *A. attenuata* will probably prove common, at least in the northern parts.

[1] The Arnicas in the collection were kindly named by Professor M. L. Fernald.

Of the several species that have lately been segregated from *A. "alpina," A. attenuata*, perhaps, in its range is the most arctic and most widely distributed and also the earliest flowering. Its present known range is from W. Greenland, between the 69th and 70th parallel, across arctic Canada, north of the limit of trees to mountains of Yukon and S. E. Alaska.

A. LESSINGII Greene, Pitt. **6**: 167 (1900). *A. obtusifolia* auth. not Less. See Hultén, Fl. Aleut. 330 (1937).—HEAD OF CHITINA R.: *H. M. Laing*, No. 203-A. NORTON SD.: hills back of Pastolik, No. 932. SEWARD PEN.: south coast, Bluff, No. 1291; Nome, No. 1402.

In the above series the heads are nodding at all stages; the ligules are very pale yellow and the fruiting heads almost globular. The achenes are quite glabrous and the pappus brownish. The basal leaves are glabrous, 3-nerved, ciliate, and the stem often scapose.

A. LOUISEANA Farr in Ott. Nat. **20**: 109 (1906). ? *A. brevifolia* Rydb. in N. Am. Fl. **34**: 329 (1927).—FAIRBANKS: Goldstream Cr. and Pedro Dome, No. 150; College, No. 243. ALASKA RANGE: Broad Pass, Nos. 95 and 96. KOKRINES MTS.: divide towards Melozitna R., No. 807. NORTON SD.: hills back of Pastolik, Nos. 930 and 932-A; dry tundra at Pastolik, No. 1021; hills back of Unalaklet, No. 1166. SEWARD PEN.: south coast, Bluff, No. 1290; north coast, Buckland R., No. 1629.

This pretty, large-flowered *Arnica*, not previously recorded from north of the type locality in the mountains of Jasper Park, Alberta, appears to be common throughout the region visited by us. In the interior it grows in open, dry spruce and birch woods, from the lowland to altitudes above 2000 feet; in the Bering Sea region it grows in herb-mats and willow thickets, north to Kotzebue Sd. and thence east to the Mackenzie. Fernald records and illustrates it from the Gaspé Peninsula and from western Newfoundland (See RHODORA, **35**: 368 and pl. 270 (1933)).

A. TOMENTOSA J. M. Macoun in Ottawa Naturalist, **13**: 166 (1899). *A. pulchella* Fern.—See RHODORA, **35**: 364 (1933).—HEAD OF CHITINA R.: *H. M. Laing*, No. 203.

Previously known only from mountains of Alberta and British Columbia and also from Newfoundland.

SENECIO ATROPURPUREUS (Ledeb.) Fedtsch. in Fedtsch. & Fler. Fl. Eur. Russ. 992 (1910). *Cineraria atropurpurea* Ledeb. in Mém. Acad. St. Petersb. **5**: 574 (1814); *Senecio integrifolius* Kjellm., Vega Exp. Vetensk. Iakttag. **3**: 29 (1883), not *S. integrifolius* (L.) Clairv.; *S. integrifolius* var. *Lindstroemii* Ostf., Kri. Vidensk. Selsk. Skr. **8**: 70,

tab. 3, fig. 20 (1910).—Kokrines Mts.: divide towards Melozitna R., No. 809.

The above differs from the plant common in the mountains of Yukon and the arctic coast east to Mackenzie by being more lanulose and by the more compact inflorescence. Also the cauline leaves are very narrow, the basal ones repand-dentate. Rare or occasional in thickets and herb-mats of the Bering Sea region, north to Seward Pen. (Kjellm.) and Kotzebue Sd.

S. conterminus Greenm.—Alaska Range: Nenana Valley, Healy, No. 375; same place, *J. P. Anderson*, No. 1970 (as *S. resedifolius*) (NY); Richardson Highw., Rapids Lodge, *E. Scamman*, No. 1031 (G). Head of Chitina R.: elevation 4800 feet, *H. M. Laing*, Nos. 207 and 208. Yukon R.: Ft. Yukon, *J. P. Anderson*, No. 1954 (as *S. resedifolius*) (NY); just above delta, No. 841.

New to the flora of Alaska.

S. frigidus (Richards.) Less.—Alaska Range: Broad Pass, Nos. 97 and 98; Richardson Highw., Paxon, No. 568. Kokrines Mts.: divide towards Melozitna R., No. 810. Seward Pen.: Nome, *Blaisdell* (NY). Diomede Isl.: No. 1728. Common in not too wet tundra of the Bering Sea region; in the interior apparently limited to the alpine zone.

S. **Kjellmanii**, n. nov. *Cineraria frigida* Richards. f. *tomentosa* Kjellm., Vega Exp. Vetensk. Iakttag. **2**: 13, tab. 1 (1883) non *Senecio tomentosus* Michx., Fl. Bor.-Am. **2**: 119 (1803).—Head of Chitina R.: elevation 5000 feet, June 26, 1925, *H. M. Laing*, No. 206; same place, elevation 5500 feet, July 25, 1925, *idem*, No. 243. Steese Highw., Eagle Summit, 109 mi. north of Fairbanks, 3800 feet, *E. Scamman*, Nos. 854–855 (G); also from high mountains west of the Mackenzie Delta (*A. E. Porsild* ined.).

The above specimens match Kjellman's detailed description and beautiful plate and also specimens from the type locality, St. Lawrence Isl.: August 15, 1891, *J. M. Macoun*, No. 71 (NY); same place, *idem*, No. 20.642 (Can) (both sub *S. frigidus*). *Senecio Kjellmanii* is perhaps nearest related to *S. frigidus*, from which it is abundantly distinct by its firm and stout rootstock, floccose-lanate and leafy stem and large heads. Not previously recorded from the mainland of Alaska.

S. lugens Richards.—Alaska Range: Nenana Valley, Lignite, No. 315; Richardson Highw., between Summit and McCarty, No. 452; Paxon, No. 589. Head of Chitina R.: *H. M. Laing*, No. 209. Kokrines Mts.: No. 684. Norton Sd.: Pastolik, No. 1025. Seward Pen.: Nome, *Thornton*, Nos. 28 and 351 (T); north coast, Kiwalik R.,

No. 1451. Common in willow thickets and in moist, grassy places of the Bering Sea region; also on high mountains of the interior.

S. PALUSTRIS (L.) Hook.—NORTON SD.: Pastolik, No. 1026. SEWARD PEN.: Nome, *Thornton*, Nos. 56 and 58 (T); north coast, Buckland R., No. 1634. Very common in the Bering Sea region in wet places. See notes under *Rorippa barbareaefolia*.

The var. *congestus* (R. Br.) Hook. is merely a depauperate edaphic form of no taxonomic importance. It may be found in any large stand of the typical plant.

S. PSEUDO-ARNICA Less.—NORTON SD.: sea-shore at Unalaklet, No. 1120. SEWARD PEN.: Nome, *Thornton*, No. 432 (T). Common on sea-shores of the Bering Sea region north to Kotzebue Sd.

In life the whole plant exhales an objectionable, fetid odor.

S. RESEDIFOLIUS Less. in Linnaea **6**: 243 (1831); Greenman, Mon. Senecio **1**, 1: 24 (1901).—NORTON SD.: hills back of Pastolik, No. 929; dry tundra ridges, Pastolik, No. 1023; hills back of Unalaklet, No. 1167. SEWARD PEN.: south coast, Bluff, No. 1294; Nome, Anvil Hill, No. 1403. Common on gravelly mountain slopes of the Bering Sea region.

All the above, with the exception of No. 1294, belong to the var. *columbianus* Gray, but, as pointed out by Fernald in RHODORA, **26**: 113 ff. (1924), in the northern Senecios, at least, the presence or absence of discoid heads is of little taxonomic value. The writer has found plants having discoid heads wherever the species occurs.

S. VULGARIS L.—TANANA R.: Hot Springs, near a recently abandoned settlement, No. 652 (no doubt introduced).

SAUSSUREA ANGUSTIFOLIA DC.—ALASKA RANGE: Richardson Highw., between Summit and McCarty, Nos. 446 and 446-A. KOKRINES MTS.: divide towards Melozitna R., No. 813. NORTON SD.: hills back of Pastolik, Nos. 934 and 935; SEWARD PEN.: south coast, Bluff, No. 1296; north coast, Kiwalik R., No. 1486; Buckland R., No. 1630. Common in dry tundra of the Bering Sea region north to the arctic coast and in high mountains of the interior. The material, like a still larger series from Arctic Canada, is very variable.

S. SUBSINUATA Ledeb.—NORTON SD.: hills back of Qiqertariaq, No. 1098.

The above large-headed and large-leaved plant is referred to *S. subsinuata*, because of the long-attenuate outer involucral bracts, the longest of which are tipped with yellow hairs. Our No. 1098 does not look like Seemann's plate, l. c. tab. 7. The leaves are wide and coarsely sinuate but such leaves are not uncommon in the very polymorphous *S. angustifolia*.

Taraxacum alaskanum Rydb.[1]—Head of Chitina R.: *H. M. Laing*, no. 244.

T. lacerum Greene.—Head of Chitina R.: on a dry slope, 4800 ft. alt., *H. M. Laing*, no. 212.

T. lateritium Dahlst.[1]—Diomede Isl.: rare on moist slopes, No. 1730. Common on Bering Sea shores.

T. mutilum Greene.—Alaska Range: Broad Pass, in wet clay in valley-bottom, No. 100; Richardson Highway, between Summit and McCarty, dry shale of slopes, No. 451. Norton Sd.: Unalaklet, seashore and dunes, No. 1118. Seward Pen.: south coast, Bluff, dry tundra, Nos. 1297 and 1298.

Crepis nana Richards. *Youngia pygmaea* Ledeb., Fl. Ross. **2**: 838; *Y. nana* (Richards.) Rydb. Rocky Mt. Fl. 1021 (1917).—Alaska Range: Richardson Highw., on gravel bars in glacial stream, Castner Glacier, No. 514. Head of Chitina R.: *H. M. Laing*, No. 214. Seward Pen.: Port Clarence, *Kjellman* (C).

Rydberg, l. c., describes this plant as being a "depressed perennial with creeping rootstock." The writer has never seen the slightest indication of a creeping rootstock in *Crepis nana;* on the contrary it has a very pronounced tap-root which is often branched into a number of caudices, where the plant, as it generally does, grows in sand subject to drifting. Kjellm. Vega Exp. **2**: 31–32 (1883) says, in part: "Planta nostra caespites densos, plane disciformes, solo adpressos format. Radix valida, verticaliter descendens." This is well illustrated by Macoun & Holm, Rep. Can. Arctic Exp. **5**: tab. 12, fig. 3 (1921),

Hooker, Fl. Bor.-Am. **1**: 297, remarks "acheniis in rostrum attenuatis." This character is barely noticeable and in the majority of achenes examined there is no constriction below the disc. The achene is smooth, finely many-ribbed, while in *C. elegans* it is few-ribbed and retrorse on the sides of the ribs.

Cr. elegans Hook. Fl. Bor.-Am. **1**: 297 (1840). *Youngia elegans* (Hook.) Rydb. Rocky Mt. Fl. 1021 (1917).—Fairbanks: Goldstream Cr. and Pedro Dome, in sandy places, No. 153. Head of Chitina R.: *H. M. Laing*, No. 215.

New to the flora of Alaska.

[1] The material of *Taraxacum* was determined by the late Dr. H. Dahlstedt, but the collection with his notes was subsequently loaned to Dr. Haglund, Lund. The above determinations, excepting that of *T. alaskanum*, were kindly supplied by Dr. Haglund.

A REVIEW OF THE GENUS GITHOPSIS[1]

JOSEPH EWAN

(Plate 555)[2]

GITHOPSIS, an endemic genus of annual campanulaceous herbs of Pacific North America, illustrates a method in the mechanics of the origin of species, namely, the fragmentation through recent geologic time of a once wide-ranging species, which may be taken as the ancestral prototype and which occupied much of the present range of the genus, into geographically discontinuous units now recognizable as species. These derivative species, then, have ultimately occupied contiguous but physiographically discrete regions.

In the field *Githopsis* species are subordinate elements in the biota, appearing in the spring months as delicate annuals growing beneath shrubs or subshrubs. They complete their life cycles in about two months and are easily overlooked in the field. It is not surprising that no synoptical study of the genus has been made during the near century that it has been known to botanists.

Githopsis as a genus was published by Nuttall in the year 1843.[3] He described at that time *Githopsis specularioides* which, accordingly, becomes the indubitable type-species of the genus. The generic name *Githopsis* was suggested to Nuttall by the long leafy calyx-lobes which recall those of the European Corn Cockle, *Agrostemma Githago*.[4] The affinity of the newly proposed genus to the campanulaceous genus *Specularia* was pointed out by Nuttall and is reflected in his choice of specific name "specularioides."

This study has been importantly advanced by generous assistance from Sir A. W. Hill, Kew, who loaned critical material, and by Mr. George Taylor, British Museum of Natural History, South Kensington, who furnished notes upon the type of *Githopsis specularioides* against selected collections sent him for comparison. In this country it is a pleasure to extend my thanks especially to Dr. W. L. Jepson who kindly made notes and comparisons for me at Kew in 1935 and

[1] Presented in abridged form at November, 1937, meeting of the Colorado-Wyoming Academy of Sciences, at Boulder, Colo.

[2] Cost of the plate defrayed by the University of Colorado.

[3] Trans. Amer. Philos. Soc. n. s. **8**: 258. 1843.

[4] Corn Cockle, which in turn seems to have received its name from another plant, is characterized by Darlington (Fl. Cestrica ed. 3, 31. 1853) thus: "This foreign weed (specifically named *Githago*, from its fancied resemblance to "Gith," or Guinea-Pepper), though diligently rooted out by all neat farmers, obstinately maintains its ground in our grain fields."

Isotype of Githopsis pulchella

who made available the photograph accompanying this paper. I am grateful to Dr. W. R. Maxon, Dr. F. W. Pennell and to Mr. C. A. Weatherby for important notes and to the curators of the following herbaria for courtesies relative to my study of their collections: California Academy of Sciences, Stanford University, University of California, Pomona College, Jepson Herbarium at Berkeley, the herbaria of Dr. Robert F. Hoover, Berkeley, and of Mr. F. W. Peirson of Altadena, California, United States National Herbarium and the Rocky Mountain Herbarium.

GITHOPSIS Nutt.—Inconspicuous annuals, usually of low often simple habit, the stems commonly angled, sometimes freely branched from near the base and then of tufted globular habit; herbage glabrous or commonly hispid-pubescent with stiff short hairs; leaves inconspicuous, scattered, the internodes evident, the leaf-blades cuneate-obovate, narrowed to the sessile base, entire or nearly so or evidently toothed at the summit and also with a few lateral teeth; flowers axillary, borne in the upper stem-axils or only terminal or both; calyx-tube medianly distended, lineate to ribbed or even deeply grooved, the lobes usually conspicuous, often equalling the tube, leaf-like (indeed often toothed in the manner of the leaves), linear-acicular or subulate to narrowly lanceolate, firm, erect to widely spreading and sickle-curving at post-anthesis; corolla minute, little if at all exserted, to larger and showy, then Linanthus-like, salverform to campanulate, one-half to one and one-half times as long as the calyx-lobes; seeds ovoid to elliptical or subtriquetrous, 0.5–1.0 mm. long, smooth, shining and concolorous.

Type species, *Githopsis specularioides* Nutt.

KEY TO THE SPECIES

Stems stout to slender but never elongated-filiform, the branches many to few; flowers evident (more than 4 mm. long); calyx-tube 4–12 mm. long.
- Middle cauline leaves oblong-ovate, conspicuous, recalling those of *Euphorbia Peplus;* corolla-lobes obtuse at the apex. ..... 1. *G. latifolia.*
- Middle cauline leaves linear or short-oblong, reduced, mostly inconspicuous; corolla-lobes rounded or acute at apex.
  - Corolla 15–20 mm. long (i. e. half again as long as the calyx-lobes), showy; plants slender, glabrate above, openly and sparingly branched ..... 2. *G. pulchella.*

Corolla 4–10 (or 15) mm. long, inconspicuous (somewhat showy in large-flowered race of *G. calycina*); plants mostly stout (slender in *G. diffusa*), setulose to glabrate, freely, often abundantly branched.
- Corolla 5–10 mm. long; fruiting calyx distended medianly, more or less strongly ribbed.
  - Corolla one-half to about equalling the calyx-lobes at anthesis, bright blue; calyx-lobes at post-anthesis erect or turbinate-spreading, linear-subulate, never outwardly sickle-curving ..... 3. *G. specularioides.*

Corolla equalling (or in a large-flowered race conspicuously exceeding) the calyx-lobes at anthesis, dark blue; calyx-lobes at post-anthesis strongly accrescent, foliaceous, lance-subulate, widely or even arcuately flaring ..... 4. *G. calycina.*

Corolla 3–5 mm. long; fruiting calyx linear, a little enlarged at the summit, 5-nerved, not at all ribbed.

Fruiting calyx 8–11 mm. long; herbage usually wholly glabrous; stems openly and sparingly branched, the plants thus tall (10–30 cm. high) and slender ..... 5. *G. diffusa.*

Fruiting calyx 4–7 mm. long; herbage distinctly setulose; stems shortly and repeatedly branched, the plants thus as broad as high (5–12 cm. high), tufted and leafy ..... 6. *G. gilioides.*

Stems elongated-filiform, the branches few, widely spreading, almost twining; flowers minute (3–6 mm. long); calyx-tube 3–5 mm. long ..... 7. *G. filicaulis.*

Treatment of the Species

1. Githopsis latifolia Eastw. Proc. Calif. Acad. Sci. ser. 4, **20**: 154. 1931, based on a coll. of (Mrs.) *A. L. Coombs*, IX 1912, made at Big Meadows, Plumas Co., Calif. Type (Calif. Acad. Sci. Herb. 171875) examined. Only upper portion of plant extant.—Stems slender, elongated, somewhat straggling, giving a loose habit; herbage almost wholly glabrous, with some few hairs along the stem-angles; middle cauline leaves oblong-obovate, sessile, scattered, entire, 12–20 mm. long, the basal leaves unknown; flowers wholly terminal; calyx-lobes about equalling or slightly exceeding the corolla, narrowly lanceolate, thin, widely spreading; corolla open-campanulate, light purple, "1 cm. across," the lobes distinctly obtuse at the apex (very broad for the genus); young capsule lightly ribbed, the bases of the calyx-lobes scabrous; seed unknown.

With the type specimen but a slender starveling of a plant, *Githopsis latifolia* is the least known member of the genus. Of this species I have seen only the type collection. Its anomalous characters of leaf and corolla lead one to doubt the propriety of maintaining it here. Yet, coming as it does from the least known area of the Sierra Nevada of California where little botanizing has been carried on since the days of the resident collectors, Mrs. Mary E. Pulsifer Ames, Mrs. Rebecca Merritt Austin[1] and John Gill Lemmon,[2] it seems worth while

[1] Mrs. R. M. Austin (1832–1919), as an active collector of the native flora between the years 1866 and 1900, botanized particularly in Modoc, Butte and Plumas counties. In addition to sending her collections to E. L. Greene, especially while he was Professor of Botany at the University of California (1885–1895), Mrs. Austin made considerable distributions of her collections. Accordingly her collections are to be found in the Brandegee Herb. at Berkeley, in the Jones Herb. at Pomona Coll. and in the U. S. Nat. Herb. Her biography has been done by Jepson, Madroño **2**: 130–133, 157. 1934.

[2] John Gill Lemmon (1832–1908) was first a resident of Sierra Valley, Plumas County, upon his coming to California. He botanized at several localities about the

to point out its characters rather prominently that we may search for the plant over that area toward the day when we may better evaluate its validity as a species.

2. G. PULCHELLA Vatke, Linnaea **38**: 714. 1874, based on *Bridges 153* from "California," the exact locality unknown. Bridges' notebooks are not extant (cf. biographical sketches by Stearns, West Amer. Sci. **3**: 223–227. 1887; Johnston, Contr. Gray Herb. **81**: 98–106. 1928; Jepson, Madroño **2**: 84–88. 1933). Isotype (in Herb. Hookerianum, Kew, England) studied. *Bridges 146*, distributed by Smiths. Inst., apparently not taken along with the type number, *Bridges 153*, since the former collection is distinctly hairy and represents a hirsutulous race. *Githopsis specularioides* var. *glabra* Jepson, Man. Fl. Pls. Calif. 974. 1925, based on *Geo. Hansen 494*, from Antelope, Amador Co., Calif. Isotypes studied.—Stems slender, divergent, striate, with a few long branches from the base, these openly or even laxly branching again, 8–20 cm. high; herbage glabrous or nearly so (somewhat setulose under binocular), hispidulose or setulose along the stem-angles, especially below; upper cauline leaves linear-oblong, serrulate, obtuse at the base, firmly rim-margined, the lower leaves all withered at anthesis; calyx-lobes linear, acicular and Phlox-like or subulate, 8–15 mm. long, shortly acute, the midnerve raised, in postanthesis the calyx-lobes in addition impressed-lineate, sometimes with a few bristle-like hairs about the sinuses of the lobes; corolla half again as long as the calyx, campanulate, deep blue, 15–17 (or 20) mm. long, the lobes shortly acute, apiculate, venose; capsule-tube broadest just above the middle, constricted at the summit, firmly to even deeply ribbed, essentially glabrous or retrorse-pubescent in age or in a hairy race; seed oblong or oval, bilaterally flattened, brown-shining, 0.8–1.0 mm. long.—Representative colls. CALIFORNIA. Amador Co.: Drytown, 500 ft., *Hansen 497;* [foothills], VI 1889, *E. L. Greene.* Calaveras Co.: Gwin Mine, 1100 ft., *Jepson 1783;* Angels Camp, 1200 ft., *J. P. Tracy 5688;* Vallecito, 1748 ft., 12 VI 1915, *A. L. Grant.* Tuolumne Co.: Chinese Camp, 30 V 1915, *A. L. Grant.* Stanislaus Co.: "California," 1854, *J. M. Bigelow;*[1] Waterford, *R. F. Hoover 1095;* Italian Bar, "wooded country," ca. 1600 ft., *Jepson 6372.* Mariposa Co.: Mt. Bullion, *Bolander 4853.*

An endemic species of the central Sierra Nevada foothills and middle elevations, *Githopsis pulchella* has a very restricted range, extending less than seventy miles in a north-south direction. This fact assists in the fixing of the probable origin of Bridges' type col-

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county during his residence there, as for instance in Mohawk Valley, in the vicinity of Culvers Ranch, on May 28, 1889. His herbarium is now at Berkeley. His biography has been written by Jepson, Dict. Am. Biog. **11**: 162–163. 1933.

[1] Perhaps from vicinity of Knights Ferry, Stanislaus River. Cf. Pac. R. R. Rept. **4**: 116. 1857, where listed as *G. specularioides.*

lection. It is known that he visited the mining town of Silver Mt. and that he passed through the already famous Calaveras Grove of Big Trees en route (cf. Madroño **2**: 85). Another English collector, William Lobb, visited the Calaveras Grove of Big Trees in 1853, having heard certain preliminary reports of trees of incredible size at a meeting of the California Academy of Natural Sciences[1] early in the same year.[2] It was by Lobb's communication of cones and material that the English horticultural world was informed of the existence of these vegetable giants. This activity of Lobb doubtless interested Thomas Bridges in visiting the region for possible novelties prized by the horticulture of that day. The reference of Bridges to "Mariposa mountains" (Trans. Bot. Soc. Edinburgh **8**: 434–435. 1866) may involve this visit of 1857, the date recorded on the isotype of *Githopsis pulchella* at Kew, and may have included the known visit to the Calaveras Grove. In any case Bridges' material represents *Githopsis pulchella* in its typical phase as it occurs commonly in the foothill country of Calaveras and Mariposa counties.

Very few illustrations of *Githopsis* species are found in botanical literature. It is interesting that the first published drawing of any species of *Githopsis* is a good likeness of *Githopsis pulchella*, although it purported to be *G. specularioides*. This appeared with a note by N. E. Brown in the Gardeners' Chronicle (ser. 3, **16**: 244. 1894, as fig. 34) and was "of a plant in the Royal Gardens, Kew," the source of the cultivated subject not indicated. Upon examination of the preserved material, the basis of the illustration, the corollas, which were illustrated as of remarkable size and wholly unknown for *Githopsis specularioides*, show the plant to be *Githopsis pulchella*. Sir A. W. Hill writes that the source of the seed from which the plant was grown at Kew is unrecorded. Since *Githopsis pulchella*, surely an attractive annual, inhabits the very Mother Lode country, may the seed not have been sent to Kew by some appreciative gold-seeker far from his beloved England upon a stroll away from his diggings?

There is apparently a hirsutulose race of this species. Indeed, both glabrous and hirsutulose plants appear in the same colony as attested by such collections as *Tracy 5688* and *Grant* from Vallecito. The corolla-parts may vary away from the pentamerous condition to from 6 to 7 (*Jepson 6311* from Chinese Camp, Tuolumne Co.). The

[1] The name carried by the Academy at its inception.
[2] See H. G. Bloomer in Proc. Calif. Acad. Sci. **3**: 399–400. 1868.

corolla-color may vary from the usual deep blue to a light purple with a white throat. Nevertheless, the flower-size is distinctive for the genus, no other species having the showy if not handsome open corollas of *Githopsis pulchella*.

3. G. SPECULARIOIDES Nutt. Trans. Amer. Philos. Soc. n. ser. **8**: 258. 1843, based on a coll. by *Nuttall* from the "plains of the Oregon, near the outlet of the Wahlamet." We know that Nuttall made his headquarters during 1835 on Sauvie Island, then called Wappatoo Island, at the mouth of the Willamette River. Accordingly it seems likely that the type specimen was taken there. Type (in Brit. Mus. Nat. Hist., South Kensington) studied for me by Mr. George Taylor and compared with submitted collections from the region. Fragments of what is apparently the type coll. at Acad. Nat. Sci., Philadelphia.—Stems stout or firm, usually short and simple or a little branched from the base, angled below, terete above, 5–12 (or 18) cm. high; herbage gray-hispidulose; middle and upper cauline leaves inconspicuous, scattered, appressed to the stem, the blades cuneate-obovate, narrowed to the sessile base, 3-toothed at the summit and often with a pair or more of lateral serratures, 4–14 mm. long, the lowermost cauline leaves with shorter blades, more orbicular or ovate, early withering; flowers borne in upper stem-axils and terminal; calyx-lobes one-half to about equalling the corolla at anthesis, impressed-lineate and with a strong midnerve, linear-subulate, shortly acute or blunt, often toothed, firm and somewhat thickened, 6–10 mm. long, lengthening at post-anthesis, then 8–14 mm. long, permanently erect to somewhat flaring but never outwardly strongly sickle-curving; corolla salverform, less often campanulate, 4–7 mm. long, bright usually "deep" blue, the lobes acute; capsule striately ribbed, often deeply so, especially at maturity; seed ovoid, 0.5–0.8 mm. long, imperfectly triquetrous or compressed, smooth, shining, light brown. Representative colls. WASHINGTON. Whitman Co.: Wawawai, V 1898, *Elmer 1015;* Columbia Co.(?): foothills of Blue Mts., 15 V 1897, *R. M. Horner 323;* Klickitat Co.: Columbia R., VI 1883, *Suksdorf.* OREGON: Marion Co.: Silverton, 1871, *E. Hall 334;* Douglas Co.: along So. Umpqua, near Riddle, 5 VI 1930, *Henderson 12,989;* Crook Co.: Grizzly Butte, 13 VI 1894, *Leiberg 220.* CALIFORNIA: Humboldt Co.: Alder Pt. on Eel R., 500 ft., *Tracy 1906;* Kneeland Prairie, 2500 ft., *Tracy 2655;* Jarnigans, VII 1888, *Chesnut & Drew;* Mendocino Co.: Sherwood Valley, *Davy & Blasdale 5214;* Handleys, V 1903, *J. MacMurphy 23;* Eel R., 6 VI 1893, *Blankinship;* Sonoma Co.: fields east of Santa Rosa, *Heller & Brown 5308;* Napa Co.: Mt. St. Helena, 30 VIII 1888, *E. L. Greene;* Wooden Valley Grade, w. side of Napa Range, "on recent burn," *Keck 1022;* Santa Clara Co.: without further loc., *M. E. P. Ames* (ex Canby Herb.); "California," without further loc. but perhaps from this co., 1868–9, *Kellogg & Harford 618;* foothills w. of Los Gatos, *Heller 7339;* Monterey Co.: Tassajara Hot

Sprs., *Elmer 3140;* Santa Barbara Co.: Painted Cave Rch., *Eastwood 87* (uncertain coll.—to be looked for in Santa Ynez Mts.); Santa Cruz Isl., "steep open slope," 21 IV 1932, *Hoffmann* (small pls., 2–4 cm. high!); Siskiyou Co.: Yreka, 1876, *E. L. Greene;* Plumas Co.: Hospital Hill near Quincy, IV 1897, *Austin 1004;* Amador Co.: Lancha Plana, 400 ft., *Hansen 1271* (very dwarf); Tuolumne Co.: Grant Rch. near Columbia, 21 V 1915, *A. L. Grant;* Mariposa Co.: e. of Merced Falls, "grassy hillsides," *J. T. Howell 4159.*

G. SPECULARIOIDES subsp. **candida,** subsp. nov.—Planta altior, altitudine 15–20 cm. basi ramosissima, caulibus multis, quadrangulatis, infime angulato-hirsutulis, ceteroqui glabriusculis; foliis reductis, sessilibus, glabriusculis, laminis cuneato-ovatis, aliquantum serrulato; calycis tubo solum striato-sulcatis, laciniis linearibus, integerrimis, ciliatis, 5–8 mm. longis; corollis albidis, 4–5 mm. longis, calycis lacinias aequantibus; seminibus subtrigonis, 0.8–0.9 mm. longis, nitento-rubicundis.—TYPE: *Munz 9806* (Pomona Coll. Herb. 98396) taken on "gravelly burn in chaparral," 6 mi. n. of Santa Ysabel, San Diego Co., Calif., 19 V 1925. ISOTYPE in Univ. Calif. Herb., Berkeley. OTHER COLLS.: Riverside Co.: 10 mi. s. of Hemet, *Munz 10,807;* San Diego Co.: Cuyamaca Lake, 4750 ft., *Munz 9753;* 1 mi. s. of Morettis, 19 V 1925 *Peirson.*

This species is considered beyond under the section Discussion.

4. G. CALYCINA Benth. Pl. Hartw. 321, 1849, based on *Hartweg 317,* from Sacramento Valley (cf. Jepson, Erythea **5**: 31–5, 51–6, 1897, as to Hartweg's localities in California). Notes upon type (in Herb. Benthamianum, Kew) and comparisons with recent collections made for the author in 1935 by W. L. Jepson. This type is discussed below. *G. calycina* var. *hirsuta* Benth., l. c., based on *Hartweg 416* from same locality as type of the species and probably taken along with it. This name is a *nomen nudum* with only the implication of its nature resting upon Bentham's choice of varietal name. The type consists of four plants differing from the species only in their markedly pubescent condition.—Plants of spreading somewhat bushy habit, 8–25 cm. high, the stem stout, strongly angled throughout, usually much branched from the base or less often only from above with spreading branches, these proximally horizontal and distally ascending or up-turned at their tips; herbage at first downy then early prevalently gray scabrous-hispidulose with abundant but scattered spreading or retrorse hairs; middle and upper cauline leaves scattered, the blades narrowly oblong or less often ovate, especially below, 8–12 (or 16) mm. long, strongly serrulate, hirsutulous, at length glabrate; flowers both axillary and terminal, large and conspicuous (for the genus), especially in a large-flowered race; calyx-tube slender-conic, clearly ribbed, 4–6 mm. long at anthesis, accrescent, glabrate, the lobes linear-subulate, acuminate or abruptly acute, 6–12 mm. long at anthesis; corolla nearly two-thirds length of calyx-lobes, cylindro-campanulate, 6–10 mm. long, bright dark blue fading whitish; capsule firm, subcoriaceous, the

calyx-lobes then 12–20 mm. long and widely outwardly spreading; seeds elliptical, lenticular, 0.8 mm. long, smooth, chestnut-brown. Representative colls.: OREGON: Jackson Co.: Wimer, 24 IV 1889, *E. W. Hammond 252.* CALIFORNIA: Mendocino Co.: Anderson Valley, 18 V 1866, *Bolander 4797;* Siskiyou Co.: Oro Fino, *Geo. D. Butler 613;* Shasta Co.: Pit R. Ferry, *H. E. Brown 257;* Redding (7 mi. from, on Alturas Hgy.), *R. F. Hoover 2279;* Tehama Co.: Stivers Rch., 25 IV 1899, *Jepson;* 2 mi. s. of Red Bluff, "low places in a grain field on a treeless plain, red clay soil," *Heller 12,327;* Plumas Co.: Round Valley, 1866, *Bolander 4693;* Marston sta. 3500 ft., *Heller 10,840* (good match for type of var. *hirsuta*, fide Jepson); Lake Co.: Lakeport, *C. F. Baker 2956;* Napa Co.: Napa R. basin, IV 1893, *Jepson;* Solano Co.: Walker Canyon, Vaca Mts., *Jepson 14,772;* Contra Costa Co.: Clayton, 16 IV 1889, *Chesnut & Drew;* Tuolumne Co.: Columbia, *Jepson 6336;* Calaveras Co.: Avery, *W. W. Eggleston 9196;* Stanislaus Co.: Woodward Reservoir n. of Oakdale, *R. F. Hoover 1937.* Intermediate coll. between *G. calycina* and *G. pulchella:* Warnerville, Stanislaus Co., Calif., *R. F. Hoover 1037* (possibly a hybrid). Large-flowered race of *G. calycina:* Butte Co.: Richardsons Sprs., *Heller 11,423;* Berry Canyon near Clear Creek, *Heller & Brown 5548;* same loc., *Heller & Brown 5491* (coll. in fruit, very variable among herbaria); 3 mi. n. of Chico, *R. F. Hoover 2236;* Iron Canyon, V 1896, *Austin 286;* fields near Chico, 25 IV 1897, *Austin 1832.*

This large-flowered race of *Githopsis calycina*, known only from Butte County, can be contrasted with the typical phase of the species as follows:

Typical G. calycina	Large-flowered race
Corolla scarcely showy, the lobes shorter than or equalling the calyx-lobes in anthesis.	*Corolla* showy, the lobes mostly exceeding the calyx-lobes in anthesis.

The author finds that the hirsute forms vastly outnumber the glabrate plants. Glabrous and the more usual hirsute plants often occur together in compact populations suggesting their origin from a single capsule. Bentham's variety *hirsuta* would, then, seem to be the prevalent biological phase of the species, with the glabrous nomenclatorially "typical" plants decidedly in the minority. It is pointless at this time to divide the species subspecifically upon the basis of pubescence. As for the type of var. *hirsuta* Dr. Jepson has recorded the pubescence as "rough, scaberulous, with short stiff spreading hairs often thickened or broadened at the base, markedly retrorse on calyx-tube, mostly spreading on calyx-segments."[1] The stems are chiefly, though not wholly, pubescent on the angles.

[1] Memorandum in Jepson Herb. accompanying *Jepson 6336*, Columbia, Tuolumne Co., compared with the type.

Bentham in describing this species writes "calycis tubus. . . . post anthesin elongatus, profunde 10-striatus." Although but one flower was sufficiently mature to show the condition well, the fruiting calyx on the type shows *strong* ribs and not mere striae. This character is not confined to the type collection but the species over its whole range has a distinctly ribbed, not merely striated, calyx-tube.

The effect of microclimates upon vernal annuals is well shown by *Githopsis* species. *Githopsis calycina* as it grows in the foothills of Butte County, California, may in one small ravine be in late fruiting stage on May 8th (e.g. *Heller & Brown 5491* from Berry Canyon) while on an adjoining hillslope one may collect six days later, on May 14th, plants in early anthesis (e.g. *Heller & Brown 5548* from same loc.). To one familiar only with a steady progression of flowering periods, what Setchell has called "waves of anthesis," this sounds incoherent and baffling. Yet while this vaster phenomenon is going on over wide biotic and climatic areas this important minor effect of microclimates is operating in more limited habitats, such as a single slope of a mountainside or a small ravine.

5. G. DIFFUSA Gray, Proc. Am. Acad. **17**: 221. 1882, based on *Parish Bros. 830* from Cucamonga Mt., San Gabriel Mts., VI 1881. Notes upon type (in Gray Herb.) communicated by C. A. Weatherby. Isotypes (in Dudley and U. S. National herbaria) studied.—Plants of slender strict habit, the stems simple or sparingly and openly branched above, 10–20 (or 30) cm. high; herbage wholly glabrous except for slight ciliation at the base of the calyx-lobes; cauline leaves obovate, crenulate or serrulate, 4–7 mm. long, plane-margined, commonly not withered at anthesis; flowers few, scattered, borne in uppermost axils; calyx-tube linear, slightly enlarged at the summit, 4–8 mm. long, 5-nerved, not at all ribbed, glabrous, the lobes linear, thin, plane, acute, rarely with a few lateral teeth, erect; corolla subcylindrical, light purple, 3–5 mm. long, the lobes acute, about half as long as the calyx-lobes; capsule but little enlarged over the flowering calyx, 5-nerved, glabrous, the calyx-lobes then spreading but straight; seeds ovoid, 0.6–0.8 mm. long, subterete, smooth, shining, light brown.—Collections examined: CALIFORNIA. Los Angeles Co.: "near Los Angeles" [Mt. Wilson, as determined by his itinerary (Ewan mss.)], 1892, *A. Davidson* (U. C. Herb.); Mt. Wilson trail, 2500 ft., 12 VI 1892, *A. Davidson* (reported in Erythea **2**: 84); one-half mile below Sturdevants, San Gabriel Mts., 3500 ft., *Peirson 1208* ("not common but at this location it was abundant for a considerable distance. Growing on shaded rather moist banks," note in Jepson Herb.); Bear Canyon trail to summit of Mt. San Antonio, *T. Craig 412;* San Bernardino Co.: Lower San Sevaine Flats, 4700 ft., *Johnston* 10 VII 1925 ("one plant at edge of runway below spring hole").

Githopsis diffusa as now known is a narrow endemic of the San Gabriel Mts. What may prove to be this species when more collections are available has been taken in the Vaca Mts. of Solano County, in the North Coast Ranges (Walker Canyon, 17 V 1892, *Jepson s. n.*). Collections of this species are rare in herbaria; the plant is delicate and growing as it does on shaded banks it is doubtless easily overlooked rather than actually absent from its localized habitats. In many of its characters *Githopsis diffusa* more closely resembles *G. specularioides* than it does its sister endemic *G. gilioides,* herein described as new.

6. G. **gilioides** Ewan, sp. nov. Planta humilis depresso-globosa altitudine 6–10 cm. basi ramosissima, caulibus subangulatis praesertim infimo striato-hirsutulis; foliis imprimis cuneato-ovatis, sessilibus, paginis ambobus saepius hirsutulis interdum glabriusculis, marginibus tenuibus nullo modo callosis; floribus sessilibus calycis tubo retrorse hirtello interdum glabriusculo laciniis acuminatis; corollis 4–5 mm. longis calycis lacinias aequantibus; seminibus ellipticis fuscis, 0.7–0.9 mm. longis, subcylindratis nullo modo angulatis.—TYPE: *Peirson 5780* (U. C. Herb. 530091) taken on chaparral "burn," Forks of San Gabriel River, Los Angeles Co., 1750 ft., 23 IV 1925. OTHER COLLS.: San Gabriel Canyon, 1600 ft., *Munz 9436;* San Antonio Canyon, dry sunny flat, 4200 ft., *Wheeler 783* (less branching, more strict than other colls.).

Githopsis gilioides, the most leafy species of the genus, is remarkable for the exceptional branching character of the plants, giving a bushy, somewhat compact habit to the species. This leafiness might be accounted for upon ecological grounds, as representing a very luxuriant phase of *G. diffusa,* were it not for the fundamental differences in flower-characters setting this species apart from other members of the genus. Plant species occupying "burns" often show notable vigor in their vegetative growth but do not exhibit alterations in their floral morphology.[1]

Like *Githopsis diffusa* this species is of interest to the plant geographer for its highly localized distribution, being confined to the San Gabriel Mts. of southern California. This mountain range, the subject of an extended botanical survey by the author to appear else-

[1] T. S. Brandegee reported in Zoe **2**: 120. 1891, *Campanula exigua* to "grow to a much greater size than usual" on a Mt. Tamalpais "burn" but apparently without morphological alteration. On the other hand plants growing on unburned areas in deep soils rich in the requisite nutrients *of the particular species* may assume the characteristic luxuriance of "burn" specimens. Every exceptional specimen cannot, therefore, be assigned to the effects of fires.

where, has been a center of origin for some seventeen species and subspecies of plants endemic to it.

7. G. **filicaulis** Ewan, sp. nov. Planta delicatula altitudine 10–25 cm. basi aliquantum ramosa et divaricata, caulibus paucis filiformibus elongatisque subvolubilibus angulatis striato-hirsutulis; foliis inconspicuis subsessilibus laminis ovato-oblongis marginibus serrulatis glabriusculis 1–3 mm. longis; floribus minutis sessilibus calycis tubo leviter striato glabriusculo 3–5 mm. longis, laciniis linearibus acutis; corollis minutissimis, calycis laciniis brevioribus; seminibus lineari-ellipticis, apicibus ambobus acutis, 0.6–0.9 mm. longis nitento-rubicundis.—Type: *C. R. Orcutt* coll. (U. S. Nat. Herb. 1402913) taken at Mission Canyon, San Diego, Calif., 8 V 1884. Isotype (in U. C. Herb.) studied. Additional Coll.: Mexico: Lower California: near Vallecito, 22 V 1886, *C. R. Orcutt*.

Githopsis filicaulis, the most slender species of the genus, follows a pattern for endemic species of many genera inhabiting San Diego County in having smaller floral parts than its relatives to the north. That is, in a given genus having several species well distributed over California, it is not uncommon to find a member showing diminutive flower-parts, often the smallest flowers of the species-group, inhabiting the extreme southern part of the state. It is sometimes a single species in a genus of perhaps half a dozen California members, such as the present genus *Githopsis;* again it may be only a subspecies or merely a well-marked race of a widely distributed species. To illustrate: *Delphinium Parryi* and *Calochortus albus* each have a small-flowered race in this region. The variety *sanguinea* of the widespread *Monardella lanceolata* represents another example of this phenomenon.

Discussion

Fernald has suggested that four closely related species of the genus *Sabatia*, section *Pleienta*, have presumably all evolved from a common ancestor which once grew on the coastal plain of southeastern North America. The four species now occupy almost completely discrete but contiguous areas within the range of the ancestral species.[1] Speciation in *Githopsis* may have come about by a like fragmentation of a once widespread ancestor, conceivably resembling *Githopsis specularioides*. This prototype, then, occupied the whole of the inhabitable valleys and lower foothills of the Pacific Coast during late Tertiary time, since the whole nature of the plant—its habit, its gross morphology and habitat-preference today—lead one to conclude

[1] See map, Fig. 188, in Sinnott, *Botany: Principles and Problems*, ed. 3, 1935.

it may have appeared with the increasing aridity and emergence of land characteristic of that era. Today the plant is a subxerophyte with a brief life-span, ideally adapted to the wet winters and early-dry summers of its habitats. *Githopsis* represents an upland type from the paleo-ecological standpoint rather than a plant of marshy or moist situations so often favored by members of this family. The great development of the genus *Crataegus* in North America is suggested by Marie-Victorin in his *Flore Laurentienne* as a direct result of the disturbance of the ecological equilibrium. *Githopsis* may similarly have arrived at its far more modest deployment into species.

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Dates of Boeckeler's Cyperaceae.—Otto Boeckeler's "Die Cyperaceen des Koeniglichen Herbariums zu Berlin" appeared in scattered numbers of the journal "Linnaea," and comprised descriptions, together with synonymy, of species then in the Herbarium of the Royal Botanical Garden at Berlin. Recently it has been my good fortune to acquire a copy of Boeckeler's work including, to a large extent, the original wrappers. The following dates with pagination for the various parts can therefore be cited:

Title page of "Linnaea"	vol. xxxv.	1867–1868.	397–512.	Wrapper lacking.
			513–612.	November 1868.
	vol. xxxvi.	1869–1870.	271–384.	January 1870.
			385–512.	April 1870.
			691–768.	December 1870.
	vol. xxxvii.	1871–1873.	1–544.	February 1871.
			545–647.	September 1873.
	vol. xxxviii.	1874.	223–256.	Wrapper lacking.
			257–384.	May 1874.
			385–512.	July 1874.
			513–544.	Wrapper lacking.
	vol. xxxix.	1875.	1–152.	February 1875.
	vol. xl.	1876.	327–384.	August 1876.
			385–452.	December 1876.
	vol. xli.	1877.	145–192.	February 1877.
			193–288.	April 1877.
			289–356.	August 1877.

—H. K. Svenson,
Brooklyn Botanic Garden

Corynephorus canescens on western Long Island.—On the sandy waste lands bordering Jamaica Bay, especially near Cross Bay Boulevard, Queens, this silvery-tufted annual grass has become exceedingly abundant. The seventh edition of Gray's Manual does not include it, but in Hitchcock's Manual of Grasses (1935) *Corynephorus* is treated as a ballast plant adventive from Europe at Philadelphia, Camden, Long Island, and Martha's Vineyard.—H. K. Svenson, Brooklyn Botanic Garden.

SOME WOODY PLANTS OF RHODE ISLAND

Ernest J. Palmer

During the summers of 1937 and 1938 I made several short excursions into Rhode Island for the purpose of adding to the very incomplete set of the woody plants of the state in the herbarium of the Arnold Arboretum. The flora of this small and accessible state has been so thoroughly explored that new discoveries could scarcely be expected. However, several plants were found that are not mentioned in the rather complete list of the state flora published by J. L. Bennett half a century ago,* and some of them do not seem to have been reported elsewhere. Most of the plants noted here are of species and varieties that have been recognized as distinct in recent years, and this is the case also with the three hybrid oaks.

About 200 species and varieties of woody plants have been recorded from Rhode Island in previous publications that I have seen. A total of 151 species and varieties were collected on my various trips, including six introduced plants. All parts of the state were visited, but little collecting was done in Newport County on account of continuous rain at the time I was there.

One of the surprising features of the state flora, in contrast with that of surrounding regions, is the scant representation of the genus *Crataegus*. Thorns may be more abundant in some sections that were not visited, especially in the southeastern part; but only three species are represented in my collections, and all of these appear to be rather rare. The species found are *Crataegus macrosperma* Ashe, *C. intricata* Lange, and *C. pruinosa* (Wendl.) K. Koch. Other species represented in the herbarium of the Arnold Arboretum by previous collections are

* Plants of Rhode Island, J. L. Bennett, Proc. Providence Franklin Soc. 1888.

Crataegus dilatata Sarg., *C. chrysocarpa* Ashe var. *phoenica* Palmer, *C. Holmesiana* Ashe, and *C. macracantha* Lodd., all of which are from the vicinity of Tiverton. *Crataegus crus-galli* L. and *C. punctata* Jacq. have also been reported from Rhode Island, and both are probably found in the state, although I have seen no specimens.

Ten species of *Rubus* were collected, of which the following are of interest as not having been mentioned in the Bennett list: *Rubus setosus* Bigel. (Slatersville), *R. multispinus* Blanchard (Cumberland Hill, North Scituate), *R. arenicolus* Blanchard (Wallum Pond), and *R. laciniatus* Willd. (Wallum Pond). The last, an introduced species, was abundant locally in wet rocky woods a little way back from the east shore of the pond.

Salix Bebbiana Sarg. was found near Smithfield and North Scituate, and *S. discolor* Muhl. var. *eriocephala* (Michx.) Anders. at Exeter. *Carya ovalis* (Wang.) Sarg., collected at Slatersville, and *C. ovalis* var. *obovalis* Sarg., near Tiverton, were both probably included under *Carya microcarpa* Nutt. of earlier lists.

The chestnut (*Castanea dentata* (Marsh.) Borkh.), once a common and stately tree in the woods of Rhode Island and throughout New England, is now represented only by sprouts from old stumps making a persistent fight against the blight. But it is interesting to note that here as in some other localities the species seems to be far from extermination, and there may be a possibility that some strain will develop immunity and outlive the blight. On a rocky slope above Sneech Pond, near Cumberland Hill, second growth plants were found that were 20 or 25 feet in height and bearing numerous fruiting burs.

Eight species and three hybrid oaks were collected on my various trips. The post oak and the pin oak and the hybrid, × *Quercus runcinata* Engelm., reported on the Bennett list, were not seen, but three additional hybrids were found. × *Quercus Rehderi* Trelease was collected near Slatersville under my number 43296, July 17, 1937. This is the hybrid between *Quercus ilicifolia* and *Q. velutina*, both of which were abundant in the vicinity, and several of the hybrids were seen. Near the same place a single specimen of × *Quercus Robbinsii* Trelease (*Q. coccinea* × *Q. ilicifolia*) was found. This was collected under number 43352, July 17, 1937. × *Quercus Saulei* Schneider (*Q. alba* × *Q. montana*) was found near Durfee Hill, south of Chepachet. The collection number is 44641, Aug. 20, 1938. The chestnut oak (*Quercus montana*) is a rather uncommon and restricted species, but it was

found growing abundantly on the north side of Durfee Hill—said to be the highest point in Rhode Island—in 1937. The locality was not thoroughly explored at that time on account of rain, but as the white oak was also growing there, and as the species seem to hybridize rather frequently, a special effort was made the following year to find the hybrid. Going south from Chepachet on U. S. highway 102, at a point about half a mile north of where the local road turns off for Durfee Hill, *Quercus montana* was quite abundant on both sides. On the east side of the highway there is a gradual wooded slope with loose boulders and outcrops of bedded schistose rock, and on one of the larger of these outcrops in a group of mostly shrubby or stunted chestnut and white oaks, a specimen was found that was an evident hybrid between the two species. The tree, about 20 or 25 feet in height, was apparently a rather old specimen, but it was not fruiting at the time of collection, although most of the chestnut oaks bore acorns.

Specimens of the three hybrid oaks are deposited in the herbarium of the Arnold Arboretum and in the herbarium of the New England Botanical Club.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY—NO. CXXV

THE NORTH AMERICAN SPECIES OF CROTALARIA

HAROLD A. SENN*

CROTALARIA L. is a widespread pantropic genus with its center of major development in tropical Africa. The whole genus includes possibly 400 species of which over 300 occur in Africa. These African species have been thoroughly and comprehensively treated by Baker f. (Journ. Linn. Soc. **42**: 241–425. 1914). Baker reviewed the early history of the genus and discussed its classification and delimitation from the closely related genus *Lotononis*. Problems of generic delimitation do not arise in treating the American material since none of the closely related genera occur here. There has been no comprehensive conspectus of the species of the genus occurring in United States, Mexico, Central America and the West Indies. Groups as well as single species from this region have been described especially by Humboldt, Bonpland and Kunth, by Bentham, by Hooker and Arnott, later by Rose and others. The West Indian species have been enumerated by Grisebach, Flora of the British West Indies, 1859, and, in part, by Fawcett and Rendle, Flora of Jamaica, **4**. 1920. On the mainland the northern United States species have been described by Robinson and Fernald in Gray's Manual, ed. 7, 1908, and the southern forms by Small, Manual of the Southeastern Flora, 1933. In Mexico the only recent enumeration has been Standley's (Contr. U. S. Nat. Herb. **23**: 1922) list of the nine fruticose species.

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In classifying the genus Baker's major divisions into simple-leaved (*Simplicifoliae* Benth.) and multifoliolate forms has been followed. Only one of Baker's multifoliolate sections occurs in the region under discussion, Section *Eucrotalaria* Baker f. For the most part it has not been possible to follow Baker's subsectional limitations in dealing with the American species of *Eucrotalaria,* since the range of flower-sizes did not permit of even moderately sharp divisions. Nevertheless two species, *C. lotifolia* L. and the closely related *C. Purdiana* Senn, characterized by short axillary racemes, clearly belong in Baker's subsection *Oliganthae.*

In the present paper thirty-one species of *Crotalaria* are recognized. These include ten introduced species (*C. Berteriana* DC., *C. verrucosa* L., *C. spectabilis* Roth, *C. retusa* L., *C. juncea* L., *C. tetragona* Roxb., *C. quinquefolia* L., *C. mucronata* Desv., *C. usaramoensis* Baker f. and *C. nana* Burm. f.), most of which are natives of India and the Asiatic tropics. *C. usaramoensis,* Baker f. is an African species cultivated in Florida and locally escaped. The American distribution of these introduced species is largely limited to the West Indies and the southeastern United States. Of the remaining twenty-one species one, *C. incana* L. is a widespread tropical weed, native to America but now common throughout the Old World tropics as well. *Crotalaria pumila* Ortega is another species which tends to become a weed and presents a wide range of variability.

The most difficult group in which to delimit the species is that centering around *C. sagittalis* L., another species which easily becomes established on disturbed ground and thus may tend to become a weed. In Virginia and North Carolina it is simply and rather sharply delimited from its congeners, *C. angulata* Mill. and *C. Purshii* DC., but when specimens from the whole of the range of *C. sagittalis* L. are studied there is seen to be a series of intergrading forms showing its close relationship with *C. Tuerckheimii* Senn, *C. pilosa* Mill., *C. stipularia* Desv. and *C. maritima* Chapm., as well as *C. Purshii* DC. and *C. angulata* Mill. The stipules vary markedly in size and shape; the pubescence ranges from closely appressed to definitely spreading and from white to tawny yellow; the habit varies from erect to procumbent and from herbaceous to suffruticose. A study of a large number of specimens of this group has resulted in the key presented below which attempts to delimit the species as accurately as possible. This complex should be thoroughly studied from the cytotaxonomic

and cytogenetic approach in order to make out more clearly the evolutionary relationships and natural limits of the species.

Certain species, especially *C. stipularia* Desv., *C. vitellina* Ker, *C. maypurensis* HBK., *C. anagyroides* HBK. and perhaps *C. nitens* HBK., are predominantly South American, reaching northward limits of their range in the region considered. Certain other species, such as *C. bupleurifolia* Schlecht. & Cham., *C. eriocarpa* Benth., *C. mollicula* HBK., *C. longirostrata* Hook. & Arn. and *C. filifolia* Rose, are probably limited to Central America or even in some instances to Mexico.

Material Studied

The *Crotalaria* material at the Gray Herbarium of Harvard University has been the basis for this study. All the material in the herbarium of the Arnold Arboretum has also been examined. The specimens from the region under consideration in the herbarium of the New York Botanical Garden and in the United States National Herbarium were examined and critical material borrowed for special study. A large loan from the Field Museum of Natural History was also examined. Type specimens have also been borrowed or photographs secured from the herbaria of the following institutions: British Museum of Natural History; The Royal Botanic Gardens, Kew; Botanical Museum, Stockholm; Jardin Botanique de l'État, Brussels; and the Muséum National d'Histoire Naturelle, Paris.

In the citations below specimens not otherwise designated are in the Gray Herbarium. The following abbreviations have been used: A, Arnold Arboretum; B, Jardin Botanique de l'État, Brussels; F, Field Museum of Natural History; G, Gray Herbarium; K, The Royal Botanic Gardens, Kew; NY, The New York Botanical Garden; P, Muséum National d'Histoire Naturelle, Paris; S, Botanical Museum, Stockholm; US, The United States National Herbarium.

Acknowledgements

I am grateful to the United States National Research Council for the grant which made this study possible and for the opportunity of collecting material in Cuba in 1938. For the opportunity of collecting material in Cuba in 1937 I am grateful to Dr. Thomas Barbour, Custodian of the Atkins Institution of the Arnold Arboretum. I am indebted to Professor E. D. Merrill for much helpful criticism and advice, and to Professor M. L. Fernald and the staff of the Gray

Herbarium for the splendid facilities afforded me there. Finally I am under especial obligation to those in charge of the institutions listed above for permitting me to examine specimens and for loaning me specimens and providing photographs of special material.

Crotalaria [Dillenius ex Linnaeus, Gen. Pl. ed. 1, 218. 1737 pro parte]; Linnaeus, Sp. Pl. 714. 1753, pro maxima parte; Endlicher, Genera, 1262. 1836–40, pro parte; Bentham and Hooker f. Gen. Pl. **1**: 479. 1865; Taubert in Engler and Prantl, Nat. Pflanzenfamilien **3**(3): 226–230. 1893; Dalla Torre and Harms, Gen. Siphon. 225. 1907; Baker f. in Journ. Linn. Soc. **42**: 251. 1914. *Atolaria* Necker, Elem. **3**: 31. 1790. *Clavulium* Desvaux in Ann. Sci. Nat. **9**: 407. 1826. *Chrysocalyx* Guillemin et Perrottet, Fl. Senegamb. Tent. 157. t. 43. 1830–33. *Cyrtolobum* R. Br. in Wallich, List, No. 5432. 1832. *Anisanthera* Rafinesque, Fl. Tellur. **2**: 60. 1836. *Crotalaria*, subg. *Iocaulon* Rafinesque, New Fl. N. Amer. **2**: 53. 1837. *Maria-Antonia* Parlatore, Maria-Antonia, Nov. Gen. Legum. 3. 1844. *Quirosia* Blanco, Fl. Filip. ed. 2, 398. 1845. *Phyllocalyx* A. Richard, Tent. Fl. Abyss. **1**: 160. 1847.

Key to the Species

A. Leaves all simple. Sect. Simplicifoliae Benth. . . . . B.
  B. Stipules when present not decurrent on the stem . . . . C.
    C. Diffuse herb, up to 4 dm. high; leaves small, 2 cm. or less long; inflorescence a capitate raceme (Asia, introduced in the West Indies) . . . . . 1. *C. nana.*
    C. Erect herbs or subshrubs, usually more than 4 dm. high; leaves larger, 3 cm. or more long; inflorescence a simple or compound raceme . . . . D.
      D. Legume short, sessile, 3–4-seeded, enclosed within the calyx; inflorescence a compound raceme; back of the standard densely pubescent (Asia, introduced in the West Indies) . . . . . 2. *C. Berteriana.*
      D. Legume elongate, stipitate, many-seeded, not enclosed by the calyx; inflorescence a terminal simple raceme; back of the standard glabrous or pubescent only along the chief vein . . . . E.
        E. Leaves broadly ovate to semi-hastate; flowers blue; young stems flexuous; stem 4-angled (widespread in the tropics, introduced in the West Indies). 3. *C. verrucosa.*
        E. Leaves elliptic or oblong to linear; flowers yellow or yellowish-red; stems terete or striate, never flexuous . . . . F.
          F. Calyx essentially glabrous; stipules broad, ovate; bracts broadly ovate, persistent (Asia, introduced into the West Indies and southern United States) . . . . . 4. *C. spectabilis.*
          F. Calyx more or less pubescent; stipules minute, setaceous or lacking; bracts linear or subulate . . . . G.
            G. Calyx-lobes broadly ovate, slightly pubescent; calyx-tube campanulate, broadly truncate at the base; carina rounded, short; leaves obovate, obtuse, glabrous above, short-pubescent beneath, not margined nor re-

curved (widespread in the tropics, introduced into the southern United States).....5. *C. retusa.*

G. Calyx-lobes linear to lanceolate, densely pubescent; calyx-tube funnel-shaped, attenuate at the base; carina sharp-angled, attenuate; leaves oblong to linear, pubescent above and beneath, margined or slightly recurved....H.

H. Bracts and bractlets conspicuous, linear; calyx-lobes 1–2 times the length of the calyx-tube; beak of the carina short, attenuate; legume essentially glabrous; leaves and branches densely pubescent; stem essentially terete (Central and South America).....6. *C. nitens.*

H. Bracts small, subulate; bractlets small, setaceous; calyx-lobes 3–4 times the length of the calyx-tube; beak of the carina long, attenuate; legume short-tomentose; leaves and branches slightly pubescent.

Leaves small (6–10 cm. long), densely pubescent; legumes light-brown; stems marked with numerous striae (Asia, introduced in America).....7. C. *juncea.*

Leaves large (10–30, mostly 14–30 cm. long), densely pubescent; legumes dark-brown; stems 4-angled (Asia, introduced in America).....8. *C. tetragona.*

B. Stipules when present decurrent on the stem (American species)....I.

I. Annual; upper part of the stem narrowly and equally winged (South America, Central America, West Indies).....9. *C. pilosa.*

I. Annual or perennial; stem free from wings or unequally winged by decurrent stipules or stipular bracts....J.

J. Inflorescence subtended by broad decurrent stipular bracts (Mexico).....10. *C. bupleurifolia.*

J. Stipular bracts absent; decurrent stipules variable, rarely completely absent, their apices acute or falcate....K.

K. Stipules large, decurrent on the stem, their apices falcate (South America and the West Indies). 11. *C. stipularia.*

K. Stipules variable, in some instances completely absent, when present narrowly decurrent on the stem, their apices acute but never falcate....L.

L. Pubescence spreading, hirsute (except *C. Tuerckheimii* var. *macrantha*)....M.

M. Plant erect, annual or perennial; leaves narrowly ovate to linear; stipules usually present, triangular, decurrent on the stem; racemes 2–4-flowered.

Usually annual; leaves narrowly ovate or lance-ovate; bracts narrowly lanceolate, sessile; corolla approximately equal to the calyx (Central America)....12. *C. Tuerckheimii.*

Annual or perennial; leaves variable, lanceolate to linear; bracts ovate-lanceolate, slender-stalked; corolla usually exceeding the calyx (North, Central and South America and the West Indies).....13. *C. sagittalis.*

M. Plant decumbent, perennial; leaves ovate, elliptic or orbicular; stipules small or absent; racemes usually 3–6-flowered (Southeastern United States, Mexico and Guatemala)....14. *C. angulata.*

L. Pubescence appressed, sericeous.

Plant erect; leaves lanceolate to linear; stipules usually present, decurrent on the stem; racemes usually 4–6-flowered (Southeastern United States and Mexico).....15. *C. Purshii.*

Plant decumbent, spreading from a woody root; leaves variable, ovate to linear; stipules usually small or absent; racemes usually 2–4-flowered (Southeastern United States, Mexico and West Indies).....16. *C. maritima.*

A. Leaves for the most part palmately 3- to multi-foliolate. Sect. Eucrotalaria Baker f....N.

N. Leaves variable, the lower simple, the upper trifoliolate (Cuba).....17. *C. Urbaniana.*

N. Leaves uniformly trifoliolate or 5-foliolate....O.

O. Leaves 5-foliolate throughout (Asia, introduced into the West Indies).....18. *C. quinquefolia.*

O. Leaves 3-foliolate throughout....P.

P. Inflorescence short, axillary; legume attenuated towards the base....Q.

Q. Inflorescence few-flowered (1–3 flowers); leaves glabrous above (West Indies).....19. *C. lotifolia.*

Q. Inflorescence several-flowered (4–8 flowers); leaves hirtellous above (Colombia and Cuba).....20. *C. Purdiana.*

P. Inflorescence long, terminal, subterminal or opposite the leaves; legume not attenuated at the base....R.

R. Legume densely tomentose with spreading hairs (except in *C. incana* var. *nicaraguensis*).

Annual; herbaceous; calyx very deeply lobed, the tube almost lacking; petiole longer than the terminal leaflet; leaflets oval to obovate or orbicular; bracts setaceous (widespread in the tropics).....21. *C. incana.*

Annual or perennial; suffruticose to fruticose; calyx lobed but a definite tube present; petiole equalling or shorter than the terminal leaflet; leaflets elliptic to oblong; bracts subulate.

Erect, tall (1.5–3.0 m. high) branches drooping; fruticose; racemes long (17–50 cm. or more); flowers large (carina 1.3–2.0 cm. long); wings shorter than the carina; bracts large (6–10 mm. long) (Mexico).....22. *C. eriocarpa.*

Erect, short (0.2–0.5 m. high); spreading habit; annual or suffruticose; racemes short (5–15 cm. long); flowers small (carina 1.2 cm. or less long); wings approximately equalling the carina; bracts small (2–6 mm. long) (Central America).....23. *C. mollicula.*

R. Legume appressed-pubescent, puberulous, or rarely glabrous....S.

S. Calyx-lobes shorter than, equalling or slightly longer than the calyx-tube....T.

T. Leaflets large (3.5–10 cm. long); carina rounded; rostrum short, stout; legume

long (3.5–4.0 cm.), puberulous to glabrous.

Leaflets elliptic to obovate; calyx narrow, pubescent, teeth longer than the tube; carina striate with purple to brown markings (widespread in the tropics, introduced in southeastern United States, Central America, and the West Indies) 24. *C. mucronata.*

Leaflets elliptic; calyx broad, campanulate, membranaceous, glabrous, teeth shorter than the tube; carina not striate (Africa, introduced into Florida) . 25. *C. usaramoensis.*

T. Leaflets small (0.7–3.5 cm. long); carina bent at a sharp right angle; rostrum long, attenuate; legume short (1.0–3.0 cm. long), puberulous.

Erect; tall (0.6–1.5 m. high); leaflets mostly elliptic or slightly obovate; flowers large (rostrum of carina 1.3–1.5 cm. long); back of the standard glabrous except for a few hairs along the mid-vein (Central America) . . . . . 26. *C. longirostrata.*

Erect or decumbent; short (4–30 cm. high); leaflets obovate to oblong; flowers small (rostrum of the carina 0.6–1.1 cm. long); back of the standard pubescent at the tip (Southern United States, Central America, the West Indies, and South America) . . . . . 27. *C. pumila.*

S. Calyx-lobes considerably longer than the calyx-tube . . . . U.

U. Herbs up to about 1 m. high; leaflets linear, acuminate, usually about 6–20 times as long as broad; flowers small (carina less than 1 cm. long); pods small (1.3–1.8 cm. long) (Mexico) . . . . . 28. *C. filifolia.*

U. Herbs or shrubs up to about 3 m. high; leaflets ovate-elliptic to elliptic-lanceolate (rarely obovate or elliptic-obovate), usually 2–6 times as long as broad; flowers large (carina 1 cm. or more long); legumes large (2–4 cm. long) . . . . V.

V. Tall herbs; petiole equalling or longer than the terminal leaflet; leaflets ovate-elliptic (rarely obovate or elliptic-obovate), 2.0–7.0 cm. long by 1.0–3.5 cm. broad; inflorescences mostly opposite the leaves; inner margin of the carina slightly pubescent; apex of the carina usually mottled with brown markings (Central America and Cuba) . . . . . 29. *C. vitellina.*

V. Shrubs; petiole shorter than the terminal leaflet; leaflets elliptic or elliptic-lanceolate, 1.5–11.5 cm. long by 0.3–3.0 cm. broad; inflorescences mostly terminal or subterminal; inner margin of the carina not mottled.

Upper branches usually slender, tending

to be terete; leaflets narrowly oblong to elliptic-lanceolate, 1.5–6.5 cm. long (av. 4.0 cm.) by 0.3–1.5 (–1.8) cm. broad (av. 0.6 cm.); under surface of the leaf puberulous; flowers distant on the racemes (Central America and Cuba).....30. *C. maypurensis.*

Upper branches usually coarse, tending to be striate; leaflets elliptic, 3.0–11.5 cm. long (av. 6.0 cm.) by 1.2–3.0 cm. broad (av. 2.2 cm.); under surface of the leaf hirtellous; flowers closely crowded on the raceme (South America and locally in Central America and the West Indies).....31. *C. anagyroides.*

Section Simplicifoliae Benth.

1. Crotalaria nana Burm. f. Fl. Ind. 156. t. 48. f. 2. 1768; Grisebach, Fl. Brit. West Ind. 179. 1859; Baker f. in Hook. f. Fl. Brit. Ind. **2**: 71. 1876; Fawc. & Rend. Fl. Jam. **4**: 10. 1920.—Type Locality: "India." Distribution: India, Burma, Ceylon; introduced in Jamaica.

I have seen no specimen of *Crotalaria nana* from North America but it is listed by Wilson (Fl. Jam. in Sawkins, Rep. Geol. Jam. 263. 1869) and Fawcett and Rendle l. c. cite as well a collection by Wullschlaegel.

2. C. Berteriana DC. Prod. **2**: 127. 1825. *C. fulva* Roxburgh, Hort. Beng. 54. 1814, *nomen nudum*, Fl. Ind. ed. 2, **3**: 266. 1832; Grisebach, Fl. Brit. West Ind. 179. 1859; Baker f. in Hooker f. Fl. Brit. Ind. **2**: 80. 1876; Fawc. & Rend. Fl. Jam. **4**: 9. 1920. *C. grandis* Baker in Hook. f., Fl. Brit. Ind. **2**: 80. 1876, in syn.—Type Locality: "in Guadalupae hortis culta." Distribution: India, Ceylon, Java, Sumatra; introduced in Hawaii and very locally in the West Indies. Jamaica: near Hope Mines, *Harris 6825*, alt. 270 m. (A, F); no collector given, *Grisebach, Fl. W. Ind.;* Short Wood, *Campbell 6243*, alt. 160 m. (NY); Hope River Cañon, *Harris 6943*, 200 m. (NY); Hope River course, *Harris 9037*, alt. 700 ft. (NY). Puerto Rico: Mayaguez Exp. Station, *N. L. & E. G. Britton 9844* (NY).

Although type material of *C. fulva* and *C. Berteriana* has not been seen, DeCandolle's description of *C. Berteriana* accords very well with the specimens examined and with Roxburgh's description of *C. fulva* published in 1832.[1] The compound racemose inflorescence, the silky-pubescent back of the standard, the ovate bracts and bractlets, and finally and, most strikingly, the very short pod enclosed within the

[1] The binomial appeared in Roxburgh's Hortus Bengalensis 54. 1814 as a *nomen nudum* but the description was not published until 1832; see C. B. Robinson in Philip. Journ. Sci. **7**: Bot. 411–417. 1912.

calyx, make this a most distinct species. Its affinities lie entirely with the Old World species, there being no American species which approaches this combination of characters.

3. C. VERRUCOSA L. Sp. Pl. 715. 1753; DC. Prod. **2**: 125. 1825; Grisebach, Fl. Brit. West Ind. 178. 1859; Duss, Fl. Phan. Antill. Fr. 192. 1897 (Ann. Inst. Colon. Marseille **3**: 192); Fawc. & Rend. Fl. Jam. **4**: 8. 1920; Urban, Symb. Antill. **5**: 278. 1920 (Fl. Domingensis), Symb. Antill. **9**: 447. 1928. *C. caerulea* Jacquin, Ic. Pl. Rar. **1**: t. 144. 1781–86. *C. angulosa* Lamarck, Encyc. **2**: 197. 1786. *C. flexuosa* Moench, Meth. Suppl. 55. 1802. *C. hastata* Steud. Nomencl. Bot. ed. 1, 239. 1821, in syn. *C. acuminata* G. Don, Gen. Syst. **2**: 134. 1832. *Anisanthera versicolor* Rafinesque, Fl. Tellur. **2**: 60. 1836. *Anisanthera hastata* Rafinesque, Fl. Tellur. **2**: 61. 1836. *Phaseolus Bulai* Blanco, Fl. Filip. 572. 1837, fide Merrill, Sp. Blanc. 177. 1918. *Quirosia anceps* Blanco, Fl. Filip. ed. 2, 398. 1845, ed. 3, **2**: 367. 1879, fide Merrill, loc. cit.—TYPE LOCALITY: "in India." DISTRIBUTION: widespread in the tropics; occurring locally throughout the West Indies, Central America and Florida as an introduced plant. BRITISH HONDURAS: Sibun River, Jones Lagoon, *Gentle 1480* (A, NY). BARBADOS ISLANDS: Waterford, St. Michael, *Bovell 352* (NY). GUADELOUPE: *Duss 2643*, low land (NY). MARTINIQUE: without locality, *Sieber I, 178*. TRINIDAD AND TOBAGO: Knagg's Hill Reservoir, *Williams 12060*.

3a. C. VERRUCOSA L. var. OBTUSA DC. Prod. **2**: 125. 1825.—FLORIDA: Miami, *Dahlberg s. n.*, March, 1938. BRITISH HONDURAS: Lower Belize River, *Record s. n.*, Feb. 1926. NICARAGUA: Managua, *Chaves 392* (US); vicinity of Managua, shore of Lake Managua, *Maxon, Harvey & Valentine 7295* (NY). PANAMA: Ahorea Lagarto to Culebra, *Cowell 363* (NY); Bohio Soldado, *Cowell 232* (NY). BAHAMA ISLANDS: Nassau, vacant lot off Shirley St. near Eastern Parade Ground, *Wight 100;* New Providence, *Cooper 80;* New Providence, Nassau, *Curtiss 29* (G, US); Nassau, *J. I. & A. R. Northrop 54*. BARBADOS ISLANDS: *Warming 60*, savanna (US); Hopewell, *Johnson 1247* (NY). CUBA: Havana, Vedado, *Leon 734* (NY); Oriente, Cabanas Bay, *Britton & Cowell 12710*, waste ground (NY). DOMINICAN REPUBLIC: without locality, *Wright, Parry & Brummel 82* (*Santo Domingo Comm. of Inquiry*) (G, US); Prov. Pacificados, Pimentel, *Abbott 697*, near sea level (US); Samaná Peninsula, vicinity of Sánchez, *Abbott 7*, sea level to 300 m. (US). GRENADA: St. George's, *Broadway s. n.*, Oct. 19, 1904, open places (G, US). GRENADINES: Becquia, *Joseph* (*for H. H. Smith*) *B. 263*, open land, 800 ft. to sea level. JAMAICA: vicinity of Kingston, *Clute 29*, alt. 500 ft. (G, US); between Kingston and Gregory Park, *Maxon & Killip 318*, along railroad, sea level (G, US); vicinity of Montego Bay, *Maxon & Killip 1655*, roadside and rocky banks (G, US); Constant Spring, *Churchill s. n.*, Mar. 21, 1897. MARTINIQUE: Corbet, *Duss 1112* (NY). MONTSERRAT: Coconut Hill, *Shafer 42* (NY, US). ST. BARTHOLOMEW: Gustavia,

Questel 79 (NY). St. Croix: Bassin Yard, *Rickseeker 72* (G, US); River Estate, *Thompson 380* (US); Frederiksted, *Rose, Fitch & Russell 3205* (NY). St. Martin: *Boldingh 3108 B* (NY). St. Thomas: without locality, *Eggers 67;* Canaan, *Eggers s. n.*, Dec. 22, 1875; without locality, *Curran 792.* Tobago: Scarboro, Breeze Hill, *Broadway 4261.* Virgin Islands: Tortola, Purcelles, *Fishlock 303.*

This is one of the best known species of the genus. It has been introduced into the West Indies and escaped from cultivation in many places to become a weed. Baker f., Journ. Linn. Soc. **42**: 254–255. 1914, reports it from Sierra Leone, Nigeria, French Equatorial Africa and Zanzibar. There is considerable variation in leaf-shape in the species. Most of the American material has the obtuse, occasionally retuse leaves of var. *obtusa* DC. rather than the ovate leaves of the type. In two of the specimens examined, *Maxon & Killip 1655* from Jamaica and *Record s. n.*, Feb. 1926, from British Honduras, there was a pronounced variation in leaf shape with a tendency toward the semi-hastate leaves of var. *acuminata* DC. Prod. **2**: 125. 1825. The blue flowers of this species and its broad and ovate foliaceous stipules make it very distinct.

4. C. spectabilis Roth, Nov. Pl. Sp. 341. 1821; DC. Prod. **2**: 125. 1825; Small, Fl. Se. U. S. 602. 1903; Larisey in Rhodora, **40**: 363. 1938. *C. sericea* Retz. Obs. Bot. **5**: 26. 1789 non Burman f. Fl. Ind. 156. t. 48. 1768; DC. Prod. **2**: 126. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Fawc. & Rend. Fl. Jam. **4**: 9. 1920. *C. macrophylla* Weinmann in Syll. Ratisb. **2**: 26. 1828. *C. cuneifolia* Schrank in Syll. Ratisb. **2**: 78. 1828. ?*C. alatipes* Rafinesque, New Fl. N. Am. **2**: 57. 1836. *C. Leschenaultii* Macfadyen, Fl. Jam. **1**: 239. 1839, probably non DC. Prod. **2**: 125. 1825. *C. Retzii* A. S. Hitchcock in Rep. Missouri Bot. Gard. **4**: 74. 1893; Small, Man. Se. Fl. 679. 1933.—Type Locality: "India orientali." Distribution: India; and introduced throughout the Old World tropics and in scattered localities in the southern United States, the West Indies and Central America. Virginia: Newport News, outside the Mariner's Museum, *Ellyson & Puette 4596*, field; Sussex Co., Homeville, *Fernald & Long 7456*, dry field. Georgia: Warm Springs, *Howell s. n.*, Dec. 1933 (US). Florida: Little River, *Dahlberg s. n.*, Nov. 20, 1937; Key West, *Blodgett s. n.*, no date (NY). Texas: Gulf Coast, *Highway Dept. 10109* (F). Honduras: Dept. Atlántida, near Tela, Lancetilla Valley, *Standley 54042*, 20–600 m. (US). Cuba: near Matanzas, *Rugel 45* (NY); Santa Clara, Lomas de Banao, *Luna 733* (NY). Jamaica: *Hitchcock s. n.*, no date (F); *Waters s. n.*, no date.

Crotalaria sericea Burm. f. is clearly another Indian species, since it is described "bracteis linearibus setaceis," whereas the bracts in the

species under consideration are broadly ovate. Consequently *C. spectabilis* Roth is the first valid name. Macfadyen distinguished *C. Leschenaultii* from *C. retusa* only by the flowers and leaves of the former being larger than those of the latter. It seems probable that *C. Leschenaultii* is conspecific with *C. spectabilis* Roth. Fawcett and Rendle, Fl. Jam. **4**: 7–12. 1920 omitted *C. Leschenaultii* and Grisebach, Fl. Brit. West Ind. 179. 1859, included it under *C. sericea* Retz. The large ovate bracts of *C. spectabilis* Roth make it easy to distinguish from *C. retusa* L. in which the bracts are small and linear.

This species occurs very locally as an escape from cultivation in America. In the United States it has been used to a small extent as a green manure crop (McKee and Enlow, U. S. Dept. Agr. Circ. **137**: 25–26. 1931).

5. C. RETUSA L. Sp. Pl. 715. 1753; Schlechtendal in Linnaea **5**: 177. 1830; DC. Prod. **2**: 125. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Duss, Fl. Phan. Antill. Fr. 193. 1897 (Ann. Inst. Colon. Marseille **3**: 193); Chapman, Fl. S. U. S. ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Urban, Symb. Antill. **4**: 281. 1905 (Fl. Portoricensis), Symb. Antill. **5**: 278. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. **4**: 9. 1920; Britton in Addisonia **7**: 47. pl. 248. 1922; Small, Man. Se. Fl. 679. 1933. *Lupinus cochinchinensis* Loureiro, Fl. Cochinch. 429. 1790. *C. retusifolia* Stokes in Bot. Mat. Med. **3**: 516. 1812. *C. Hostmanni* Steudel in Flora **26**: 757. 1843.—TYPE LOCALITY: "in India." DISTRIBUTION: tropical Africa, India, Ceylon, China, Malay Peninsula, N. Australia, rarely in coastal south-eastern United States, Central America, commonly in the West Indies. NEW JERSEY: Hunterdon Co., Califon, *Fisher s. n.*, Sept. 21, 1902 (US). SOUTH CAROLINA: Santee Canal, old garden, no collector given. GEORGIA: Thomasville, *Mrs. A. P. Taylor 8771* (US). FLORIDA: Tallahassee, *Farlow s. n.*, Nov. 1891; Madison Co., 5 miles east of Madison, *Wiegand & Manning 1506*, sandy roadside; Marion Co., Ocala, *Shockley 1878;* Polk Co., Fort Meade, *J. D. Smith s. n.*, Apr. 4, 1880; St. Petersburg, *Mrs. C. C. Deam 2950*, bank of pond (NY, US); Tampa, *J. D. Smith s. n.*, Mar. 9, 1880 (US); Dade Co., near Silver Palm, *J. K. Small, Mosier & G. K. Small 6988*, pinelands (NY); Dade Co., Black Point, *Moldenke 400*, dry sandy soil along roadside (NY); Coconut Grove, *Young 40*, orchard (US); West Palm Beach, *Webber 63* (NY). LOUISIANA: Hamburg, *McAtee 2212* (NY, US). MISSISSIPPI: Mississippi City, *Phares 19* (US). TEXAS: Fort Worth, *Mrs. J. P. Stephenson 76* (US). MEXICO: Tamaulipas: Tampico, *Pringle 7674* (G, US); 8 km. east of Tampico, vicinity of La Barra, *E. Palmer 289*, 1910, sea level (G, US). Vera Cruz: Puerto de Alvarado, *Seler 4479* (G, US). BRITISH HONDURAS: Keys off coast, *Stevenson 159* (US); Belize River, Little Cocquericot, *Lundell 4368* (US); Sibun River, Craig Point,

Gentle 1406 (A, NY); New Town, *Schipp 816;* pine ridge near Manatee Lagoon, *Peck 128.* HONDURAS: Dept. Atlántida, vicinity of Tela, *Standley 56881, 53012,* sea level (US); near Puerto Sierra, along Yuro road, *Wilson 57,* potrero (NY, US); vicinity of Tela, *Mitchell 40,* sandy soil, under coconut palms on sea shore. NICARAGUA: Corinto, *Maxon, Harvey & Valentine 7208* (US); shore of Lake Managua, vicinity of Managua, *Maxon, Harvey & Valentine 7251* (US). COSTA RICA: near Puntarenas, Pitahayavieja, *West 3557,* bank of a tidal creek at edge of a mangrove swamp, alt. 5 m.; Boca Banana, Altantic shore, *Corduz 9150* (US); Limon, *Lehmann 1016,* dunes (US); Prov. Alajuela, vicinity of Capulin on the Rio Grande de Tárcoles, *Standley 40110,* alt. 80 m. (US). PANAMA: Canal Zone, vicinity of Fort Sherman, *Standley 31222* (US); Taboga Island, *Standley 27973* (US). BAHAMA ISLANDS: New Providence, Nassau, *Curtiss 25.* CUBA: Santa Clara Prov., Cienfuegos, Cieneguita, *Combs 25;* Santa Clara Prov., Soledad, near Harvard House, *Senn 12, 392,* potrero; Habana Prov., Santiago de las Vegas, near Wapay, *Baker & Wilson 338;* Santiago Prov., vicinity of San Luis, *Pollard & W. Palmer 299;* Cuba orientali, *Wright 117;* Isle of Pines, Vivijagua, *Jennings 108,* fields (NY). JAMAICA: St. Margaret's Bay, *Millspaugh 1937;* vicinity of Montego Bay, *Maxon & Killip 1650,* roadside; between Kingston and Gregory Park, *Maxon & Killip 319,* along the railroad, sea level; Constant Spring, *Churchill s. n.,* Mar. 21, 1897; without locality, *Wilson 282.* HAITI: Miragoane and vicinity, *Eyerdam 413;* Etang Saumatre, vicinity of Fond Parisien, *Leonard 4189,* borders of fields. DOMINICAN REPUBLIC: Santo Domingo, *von Türckheim 2598,* weedy places. PUERTO RICO: near Mayaguez, *Heller 4509,* along the beach, alt. 10 ft.; near Maricao, *Sintenis 3.* VIRGIN ISLANDS: Virgin Gorda, *Fishlock 182,* open places, fields, valley; Tortola, *Fishlock 30,* pastures, experiment station; St. Thomas, *Pease 22904;* St. Thomas, *Curran 790;* St. Thomas, *Eggers 222.* ANTIGUA: St. Johns, *Shafer 4* (NY). ST. MARTIN: *G. G. & B. W. Goodwin 10* (NY). GUADELOUPE: near la Basse-terre, *Duss 3018* (NY). MARTINIQUE: Saint-Pierre, *Duss 1110* (NY). ST. BARTHOLOMEW: St. Jean, *Questel 13* (NY). ST. LUCIA: *Walsh s. n.,* Sept. 1889 (NY). ST. KITTS: *Walsh s. n.,* Sept. 1889 (NY); Wingfield estate, *Britton & Cowell 597,* pastures (NY). ST. CROIX: Frederiksted, *Rose, Fitch & Russell 3202* (NY). ST. VINCENT: *H. H. & G. W. Smith 176,* fields and roadsides, 1000 ft. to near sea level. GRENADA: Belmont, *Broadway s. n.,* Dec. 1904, lowlands. TRINIDAD AND TOBAGO: Laventille, *Williams 12061.*

This is the most common and widespread of the Old World species which have been introduced into America. Throughout the West Indies it is found as a common weed of pastures and waste places. *Crotalaria retusa* somewhat resembles *C. spectabilis* Roth but may easily be differentiated from it by its ovate stipules and bracts, in

contrast to the minute setaceous stipules and linear bracts of the former. In some instances the stipules may be completely lacking in *C. retusa.*

6. C. NITENS HBK. N. Gen. Sp. Pl. **6**: 399. 1824. *C. nitidula* Mart. ex Schrank, Syll. Ratisb. **2**: 78. 1828. *C. bracteata* Schlechtendal & Chamisso in Linnaea **5**: 575. 1830, non Roxburgh, Hort. Beng. 54. 1814, Fl. Ind. ed. 3, 278. 1832. *C. Schiedeana* Steudel, Nomencl. ed. 2, **1**: 445. 1840.—TYPE LOCALITY: "Crescit prope Mariquita et Honda, alt. 160–400 hex. (Nova Granata)." DISTRIBUTION: Mexico, Guatemala, Honduras, Colombia, Peru, Bolivia and Paraguay. MEXICO: Vera Cruz: Hacienda de la Laguna, photograph (F, G) and fragment (F), of *Schiede 597*, type of *Crotalaria bracteata* Schlecht. & Cham.; *Linden 688;* Zacuapan, *Purpus 2329*, dry meadows (G, US); Zacuapan, *Purpus 8007* (G, US); Tlacatepec, El Fortin near San Martin, *Purpus 14217* (A, F), *16355* (G), rocks and rocky slopes; Zacuapan, *Purpus 10880*, rocky oak forests (US); near Jalapa, *Rose & Hough 4312* (US). Oaxaca: vicinity of Choapam, *Nelson 854*, 3800–4500 ft. GUATEMALA: Alta Verapaz, Coban, *von Türckheim II 1948*, 1350 m. (G, US); Alta Verapaz, Samac, *von Türckheim 104*, 4500 pp. (US); Dept. Huehuetenango, San Martin, *Seler 2766* (US), extreme form with acuminate leaves; Dept. of Quiche, Nebaj, *Skutch 1768*, 5700 ft. (A). HONDURAS: Dept. Comayagua, vicinity of Siguatepeque, *Standley 56370* (US).

The large conspicuous, persistent bracts and bracteoles make this a distinctive species. This character is especially conspicuous since peduncles bearing several flowerless bracts frequently occur. There is considerable variation in leaf-width within the species. The photograph of the co-type from the Berlin Herbarium (*Humboldt* in hb. Willd., Rio Magdalena) shows rather broad elliptic-cuneate to slightly obovate-cuneate leaves, whereas the photograph of the type of *C. bracteata* Schlecht. & Cham. (*Schiede 597*) shows much narrower oblong leaves. The cited collections, *Purpus 8007*, *16355* and *Linden 688*, approach the former in leaf-width although they are not obovate, whereas *von Türckheim II 1948* and *Purpus 2329* resemble *Schiede 597*. The dense pubescence of leaves and the stem and especially of the calyx, the margined or slightly recurved leaves, the large conspicuous bracts and the glabrous legumes support the conclusion that these represent one specific entity.

7. C. JUNCEA L. Sp. Pl. 714. 1753; DC. Prod. **2**: 125. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Fawc. & Rend. Fl. Jam. **4**: 8. 1920. *C. benghalensis* Lamarck, Encyc. **2**: 196. 1786. *C. fenestrata* Sims in Bot. Mag. **44**: t. 1933. 1817. *C. porrecta* Wall. List, No. 5363. 1832, *nomen nudum*. *C. viminea* Wall. List, No. 5397 B. 1832, *nomen nudum*.

C. tenuifolia Roxb. Fl. Ind. ed. 2, **3**: 263. 1832. Type Locality: "in India." Distribution: Asia, introduced and escaped locally in the West Indies. Jamaica: Kings House Grounds, *Harris 6905* (NY), *11856* (G), sandy places, 400 ft. alt.; Half-Way Tree Road, *Harris 8274*, 300 ft. (NY). Dominican Republic: Hania, *Farrs 370*, roadside (US). St. Croix: Bassiv, *Ricksecker 211*, pasture (US). Martinique: St. Jean, *Duss 26* (NY); Parnasse, *Duss 1111* (NY).

This is the widely cultivated Sunn Hemp of India. The species occurs throughout the plains of India from the Himalayas to Ceylon and also in Malaysia and Australia. In the West Indies it has escaped from cultivation and become an annual shrubby weed.

8. C. tetragona Roxb. ex Andr. Bot. Rep. **9**: t. 593. 1809; Roxb. Fl. Ind. ed. 2, **3**: 263. 1832; Baker f. in Hooker f. Fl. Brit. Ind. **2**: 78. 1879; Fawc. & Rend. Fl. Jam. **4**: 9. 1920. *C. tetragonoloba* Roxb. ex Steudel, Nomencl. ed. 2, **1**: 445. 1840.—Type Locality: "Nepal." Distribution: India to Java. Jamaica: vicinity of Cinchona, roadside near Chestervale, *Britton 3* (NY).

Only one American specimen of this species was found in the herbaria examined. It is chiefly distinguished from its close congener *C. juncea* L. by its larger leaves and dark-brown pods.

9. C. pilosa Miller, Gard. Dict. ed. 8, No. 2. 1768, non *C. pilosa* Roxb. ex Mart. Denkschr. Acad. Muench. **6**: 156. 1820, non *C. pilosa* Thunb. Prod. Pl. Cap. 125. 1800, non *C. pilosa* Rafinesque, New Fl. N. Amer. **2**: 54. 1836. *C. pterocaula* Desvaux in Desv. Journ. Bot. **3**: 76. 1814; DC. Prod. **2**: 124. 1825; Grisebach, Fl. Brit. West Ind. 178. 1859 (excl. syn.). *C. genistella* HBK. Nov. Gen. Sp. Pl. **6**: 398. 1824; DC. Prod. **2**: 124. 1825; Bentham in Ann. Nat. Hist. **3**: 428. 1839.—Type Locality: "grows naturally at La Vera Cruz in New Spain." Distribution: South America and Mexico, Costa Rica, Panama, Cuba and Jamaica.

Crotalaria pilosa Miller and the succeeding seven species constitute a well defined American group characterized by small flowers and by the stipules (when present) more or less decurrent on the stem. To it Rafinesque, New Fl. N. Amer. **2**: 53. 1836, gave the subgeneric name *Iocaulon*. The specific lines within this group are somewhat indistinct and difficult to delimit. The present species, *C. pilosa* Mill. differs from the others of the group by the presence of definite equal regular wings on the upper part of the stem, the wings being continuous with the small triangular stipules.

Crotalaria pilosa Miller seems to be the earliest name available for this species. The photograph of the type specimen in the British Museum, kindly loaned by Mr. E. P. Killip of the United States

National Herbarium, clearly shows the winged stem characteristic of this species. While Miller's description does not indicate that the stems are winged the illustration and description of Martyn (Hist. Pl. Rar. 43. [t. 43.] 1728) to which he refers, obviously are based on the species under discussion, and Miller's specimen has winged stems.

The species contains three distinct but closely related varietal forms all characterized by the winged stem. The type specimen of *Crotalaria pilosa* is the broader-leaved form with leaves 1.2–2.0 cm. broad. In contrast the variety described below as var. *Skutchii* has leaves only 0.3–1.0 cm. broad. The pubescence cannot be clearly seen in the photograph of the type but is obviously much less conspicuous than that of variety *Skutchii* and much like that of *Lamb 568*.

KEY TO THE VARIETIES

Pubescence sparse, hirtellous; leaves lanceolate or elliptic.
  Leaves lanceolate, 1.2–2.0 cm. broad; flowers small, vexillum about 1 cm. long ..... Var. *typica*.
  Leaves elliptic, 2.0–4.0 cm. broad; flowers large, vexillum about 1.2–1.8 cm. long ..... Var. *robusta*.
Pubescence dense, sericeous; leaves linear to narrowly lanceolate ..... Var. *Skutchii*.

Var. TYPICA. MEXICO: Vera Cruz: photograph of *Houston s. n.* (TYPE of *C. pilosa* Miller, in the herbarium of the British Museum) (US). Tepic: Zopelote, *Lamb 568* (G, NY, US).

9a. C. PILOSA Miller var. **robusta**, var. nov., a forma typica differt foliis latioribus (2.0–4.0 cm. latis) ellipticis; floribus majoribus (vexillum 1.2–1.8 cm. longum).—MEXICO: Mexico: dist. Temascaltepec, Cumbre de Tejupilco, *Hinton 2686*, in oak woods, alt. 2000 m. (TYPE in the United States National Herbarium).

This is a much larger and coarser plant, especially its leaves and flowers, than either the typical variety or var. *Skutchii*.

9b. C. PILOSA Miller var. **Skutchii**, var. nov., a varietate typica differt foliis angustioribus, linearibus vel lineari-lanceolatis, foliis caulibusque dense sericeis. COSTA RICA: Prov. San José, vicinity of El General, *Skutch 3071*, alt. 730 m. (TYPE in the Gray Herbarium); Cima Grande entre San Ramón y Atenas, *Brenes 11322*, 1175 m. (F); Acosta near San Tonacio, *Lankester 1174* (US). PANAMA: Canal Zone, Ancón Hill, *Standley 26357*, open grassy slope (G, US); Canal Zone, Red Tank to Pueblo Nuevo, chiva-chiva trail, *Piper 5143* (US); Canal Zone, Ancón Hill, *Killip 12075*, alt. 100–200 m. (US); Taboga Island, *Standley 28000* (US); Prov. Panama, near big swamp east of Rio Tecuman, *Standley 26581* (US); Prov. Panama, near Chepo, Sabana de Dormisolo, *Pittier 4654*, alt. 60–80 m. (NY). CUBA: without locality, *Wright 2293;* Oriente, Pinar de lá Caridad, southeast of

Yara, *Ekman 14682* (NY); Matanzas, Yacán Hill, San Miquel, Baños, *Leon & Roca 8837*, gravelly hilltop (NY); vicinity of Madruga, *E. G. & N. L. Britton & Shafer 734*, eruptive rock soil (NY); Pinar del Rio, near de las Vueltas, Rancho de Juan, Cajalbana, *Leon & Charles 4908* (NY); Isle of Pines, Nueva Gerona, *Curtiss s. n.*, Jan. 1904 (NY); Isle of Pines, vicinity of Jucaro, *N. L. & E. G. Britton & Wilson 14615*, pinelands. Jamaica: Upper Clarendon, James' Hill Savanna, *Harris 12844*, 2400 ft., near edge of swamp; without locality, *Hart s. n.* (F).

This variety, which is the most widespread form within the species, is distinguished from the type by its narrow linear leaves and their densely sericeous indumentum.

10. C. bupleurifolia Schlechtendal and Chamisso in Linnaea **5**: 575. 1830; Hooker, Ic. Pl. **4**: t. 372. 1841. *C. Heldiana* A. DC. in A. & A. P. DC. Mém. Soc. Phys. Hist. Nat. Genève **9**: 97 (23). 1841.—Type Locality: Hacienda de la Laguna, Mexico. Distribution: Mexico. Mexico: Sinaloa: San Ignacio, *Montes & Salazar 101*, alt. 1380 m. (US); San Ignacio, *Ortega 459*, 1380 m., Quebrada chica (A). Guerrero: Sierra Madre, *Langlassé 792*, 1750 m. (G, US); Chiconquiaco, *Schiede 596* (G, NY), cited by Schlechtendal, Linnaea **12**: 279. 1838. Oaxaca: Cerro Espino, *Reko 3621* (US). Vera Cruz: Zacuapan, Barranca de Tenampa, *Purpus 3663* (F, G, NY, US); Orizaba, *Mohr & Botteri s. n.*, July 1857, cultivated ground and pasture (US); *Botteri s. n.*, 1857 (US). Photograph of the type of *C. Heldiana* from seed from the garden at Carlsruhe, original source unknown, the type in the herbarium of the Geneva Botanic Garden.

This is rather a distinctive species, characterized by stipular bracts which subtend the flower-peduncles. No other stipules occur.

11. C. stipularia Desvaux in Desv. Journ. Bot. **3**: 76. 1814; DC. Prod. **2**: 124. 1825; Bentham in Ann. Nat. Hist. **3**: 428. 1839; Grisebach, Fl. Brit. West Ind. 178. 1859 (as *C. stipularis*); Duss, Fl. Phan. Antill. Fr. 192. 1897 (Ann. Inst. Colon. Marseille **3**: 192) (as *C. stipularis*); Urban, Symb. Antill. **4**: 280. 1905 (Fl. Portoricensis), Symb. Antill. **8**: 278. 1920 (Fl. Domingensis). *C. Espadilla* HBK. Nov. Gen. Sp. Pl. **6**: 399. 1824; DC. Prod. **2**: 124. 1825. *C. sagittalis* Vellozo, Fl. Flum. 308. 1825, Ic. Fl. Flum. **7**: t. 111. 1827. *C. sagittalis* Desv. ex Grisebach, Fl. Brit. West Ind. 178. 1859, in syn. *C. sagittalis* L. var. *Espadilla* O. Ktze. Rev. Gen. Plant. **1**: 175. 1891.—Type Locality: "in Cajenna." Distribution: Northern South America, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, Dominica, Martinique, St. Vincent and Trinidad.

Although the type of this species was not available, four specimens from the vicinity of Cayenne, French Guiana (the type locality), were examined: *Broadway 333*, savannah; *Broadway 503*, sea shore; *Broad-*

way 564; Reservoir Hill, Matabon, *Broadway 794.* These specimens have the ovate-lanceolate leaves and large foliaceous stipules of Desvaux's description. The falcate incurved tips of the stipules and their decurrent bases which usually reach the complete length of the internode are most characteristic of this species, giving the appearance of a stem with successive triangular wings. The leaves of these Cayenne specimens vary in length from 1.5 to 3.0 cm. and in width from 0.6 to 1.3 cm. The stipular width at the node varies from 0.4 to 1.0 cm. These plants appear to be annuals with erect or ascending habit. The length of the internodes of the branches ranges from 1.1 to 4.0 cm. The leaves and stems are moderately sericeous.

There are two distinct forms in the region under discussion, which differ from the above interpretation of the type.

KEY TO THE VARIETIES

Internodes moderately long (1.1–4.0 cm.); leaves moderately large (1.5–3.0 x 0.6–1.3 cm.); stipules moderately broad at the node (0.4–1.0 cm.) ..... Var. *typica.*
Internodes short (0.6–1.0 cm., rarely longer); leaves small (0.6–2.4, mostly less than 1.5 cm. long, 0.4–0.6 cm. broad); stipules moderately large (0.4–0.9 cm. broad at the node) Var. *serpyllifolia.*
Internodes long (3.0–5.5 cm.); leaves large (2.5–6.5, mostly 4.0–6.0 cm. long, 0.8–3.0, mostly 1.1–2.0 cm. broad); stipules very large (0.8–1.4 cm. broad at the node) ..... Var. *grandifolia.*

Var. **typica.** HAITI: Dept. du Nord, vicinity of Marmelade, *Leonard 8255*, 800 m. (US); *Leonard 8222*, grassy summit of mountain, 800 m. (US). PUERTO RICO: Pueblo Viejo, *Stevenson 2571* (US); Juncos, *Stevenson 2988* (US). FRENCH GUIANA: Cayenne, *Broadway 333, 503, 564, 794*, type locality.

11a. C. STIPULARIA Desv. var. SERPYLLIFOLIA DC. Prod. **2**: 124. 1825.—PUERTO RICO: along the railroad north of Mayaguez, *Heller 4574*, 15 ft. (G, US); Mayaguez, Monte Mesa, *Britton & Hess 2719* (NY); Santa Ana near Sabana Grande, *Britton & Cowell 4028A*, clay hillside (NY). TRINIDAD: south of Dabadie, Piarco Savanna, *Britton & Hazen 702.*

This variety occurs also in Brazil (Ceará, Fortaleza, Bairro de Beneficia, low waste ground near Lagon do Tanágre, *Drouet 2233, 2506*, sandy beaches).

11b. C. STIPULARIA Desv. var. **grandifolia,** var. nov., a varietate typica differt internodiis elongatis, 3.0–5.5 cm. longis, sparse pubescentibus; foliis magnis, 2.5–6.5 (saepissime 4.0–6.0) cm. longis, 0.8–3.0 (saepissime 1.1–2.0) cm. latis, fere elliptico-lanceolatis, sparse pubescentibus; stipulis magnis, basi 0.8–1.4 cm. latis, apice longe recurvis.—HAITI: Corail, *Nash & Taylor 1019*, mountain slopes (NY);

Plaisance, *Nash 639*, 2000 ft. (NY); Dept. Artibonite, sect. Dessalines, vicinity of Kalacroix, *Leonard 7859*, cultivated slopes, 700 m. (US); Massif du Nord, Le Borgne, Rose Marie Congo, *Ekman N. H. 4843*, 700 m. (US). DOMINICAN REPUBLIC: Prov. de La Vega, near Garabawa at Rio Yaquir, *Fuertes 1669*, 550 m. (NY). PUERTO RICO: near Mayaguez, in hills at Boquillas, *Sintenis 10* (G, US); near Mayaguez, *Holm 106*, dry fields; near Maricao, Indiera Fria, *Britton, Cowell & Brown 4475*, 430–800 m. (NY); Santa Ana near Sabana Grande, *Britton & Cowell 4028 B*, clay hillside (NY); Sabana Grande, B. Rincon, *Velez 841* (NY); Trujillo Alto, *Britton & Matz 7051* (NY); Rio Piedras, near Guarabo, *Stevenson 2988* (NY). GUADELOUPE: Trois-Rivières, *Duss 2664*, 10–500 m. (NY); Basse-Terre to Gombegu, *Duss 3431* (NY, US). DOMINICA: Soufrieie, *Lloyd 432* (NY); Grand Savannah, *Lloyd 835* (NY). MARTINIQUE: River Salie, Zion-Vaillant, near St. Pierre, *Duss 1113* (NY, US); Fort Vaillant, *Hahn 239*, TYPE, in the Gray Herbarium, ISOTYPE in the United States National Herbarium. ST. VINCENT: *H. H. & G. W. Smith 157*, open places and roadsides, 800 ft. to sea level; near Barrovollie, *H. H. & G. W. Smith 1053* (NY).

The variation in leaf-size on the individual plant suggested by Grisebach, Fl. Brit. West Ind. 178. 1859, in his varieties *oblonga* and *sericea* is not at all pronounced in most of the material studied, although there is a tendency toward this variation in *Leonard 8255* of var. *typica* and in *Britton, Cowell & Brown 4475* of var. *grandifolia*. This is a common South American species which has reached only the more southern West Indian islands. It is closely related to *C. sagittalis* L., *C. pilosa* Mill. and the South American *C. Pohliana* Benth.

12. C. **Tuerckheimii**, sp. nov. Herba versimiliter annua, *C. sagittali* affinis ad 33 cm. alta; caulibus teretibus vel subteretibus, simplicibus vel ramosis, ramis erectis, dense pilosis; foliis simplicibus anguste ovatis vel lanceolato-ovatis, basi rotundatis vel raro subcuneatis, 1.0–1.6 cm. latis, 2.5–4.2 cm. longis, sessilibus vel breviter petiolatis, utrinque pilosis; stipulis variabilibus, inferne nullis, superne late lanceolatis decurrentibus, circa 2 mm. latis; inflorescentiis lateralibus vel subterminalibus, 1–4-floris, 6–10 cm. longis, pedunculo pedicellisque fulvo-pilosis, bracteis solitariis, lineari-lanceolatis, circa 5 mm. longis, 0.5 mm. latis; bracteolis 2 ad basim calycis, lineari-lanceolatis eadem magnitudine bractearum; calyce dense fulvo-piloso, profunde lobato, lobis superioribus paullo latioribus, lanceolatis, circa 1 cm. longis, 2 mm. latis, inferioribus lanceolatis, circa 1.5 mm. latis; tubo brevi, circa 2.5 mm. longo; corolla ochroleuca calycem subaequante; legumine oblongo 2.5–3.0 cm. longo, 1.2–1.3 cm. lato, glabro, fulvo vel nigrescente.—DISTRIBUTION: Mexico, Guatemala, El Salvador, Panama, Cuba. MEXICO: Sonora: Rio Mayo, Sierra Chiribo canyon, *Gentry 1399*, old garden (F, G). San Luis Potosi: San Luis Potosi, 22° N. lat. *Parry & Palmer 127½*, alt. 6000–8000 ft. Durango:

La Bajada, Tamazula, *Ortega 4398* (US). Morelos: north of Cuernavaca, *Russell & Souviron 256* (US). Nayarit: Tepic, *Palmer 1867*, 1892 (F). Vera Cruz: Vallée de Cordova, *Bourgeau 1723;* Salto de Agua, *Purpus 1747*, dry open woods; Cordoba, *Orcutt 3147* (F). GUATEMALA: Alta Verapaz, Coban, *von Türckheim II 1282*, 1350 m., (TYPE in the Gray Herbarium, ISOTYPES in the Field Museum of Natural History and the United States National Herbarium); Alta Verapaz, Coban, *von Türckheim 239*, 4300 pp. (G, US); Alta Verapaz, vicinity of Secanquim, *Pittier 283*, alt. 550 m. (NY, US); Dept. Baja Verapaz, Sierra de las Minas, App. El Rancho, *Kellerman 8029*, 3500 ft. (F). EL SALVADOR: San Salvador, *Calderón 4*. PANAMA: Changuinola Valley, *Dunlap 117* (F); Prov. Panama, near Chepo, Sabana de Dormisolo, *Pittier 4686* (US). CUBA: without locality, *Wright 3528*.

12a. C. TUERCKHEIMII Senn var. **macrantha**, var. nov., a varietate typica differt foliis utrinque adpresse pilosis, floribus majoribus (circa 1.5–1.6 cm. longis).—MEXICO: Mexico: dist. Temascaltepec, Temascaltepec, *Hinton 5068*, oak woods, alt. 1750 m. (TYPE in the United States National Herbarium); Rincon, *Hinton 5624*, oak wood, 2140 m. (F); Rincon de Carmen, *Hinton 1730*, alt. 1340 m. (US). Sinaloa: *Ortega s. n.* (US). Jalisco: Sierra Madre Occidental, San Sebastian, *Mexia 1484-b*, arroyo seco, s. w., thicket near stream, 1500 m. (US).

This new species is very closely related to *Crotalaria sagittalis* L., from which it differs by the leaves which are rather uniformly ovate or ovate-lanceolate throughout the plant, by the narrow lanceolate bracts in contrast to the ovate-lanceolate, slender-stipitate bracts of *C. sagittalis* L., by the corolla approximately equalling the calyx, and by the usually annual habit of the plant. The collection from Sonora, *Gentry 1399*, varies from the type in that the pubsecence is white instead of fulvous. The new variety *macrantha* has distinctly larger flowers than the typical form, and its leaves have scattered adpressed-pilose pubescence in contrast to the abundant spreading hairs of the variety *typica*.

13. C. SAGITTALIS L. Sp. Pl. 714. 1753, except var. β; Lamarck, Encyc. **2**: 195. 1786, except var. β; Willd. Sp. Pl. **3**(2): 972. 1803, pro parte: Michaux, Fl. Bor. Am. **2**: 55. 1803, except var. γ *ovalis;* Pursh, Fl. Am. Sept. **2**: 469. 1814; Elliott, Sketch **2**: 193. 1822; DC. Prod. **2**: 124. 1825; Beck, Bot. 77. 1833; Darlington, Fl. Cestrica 404. 1837; Torr. & Gray, Fl. N. Amer. **1**: 370. 1840; Britt. & Brown, Ill. Fl. N. U. S. **2**: 268. fig. 2055. 1897; Chapman, Fl. S. U. S. ed. 3, 96. 1897; Small, Fl. Se.U. S. 602. 1903; Urban, Symb. Antill. **4**: 280. 1905 (Fl. Portoricensis); Robins. & Fern. in Gray's Man. ed. 7, 507. 1908; Fawc. & Rend. Fl. Jam. **4**: 10. 1920; Urban, Symb. Antill. **8**: 278. 1920 (Fl. Domingensis), Symb. Antill. **9**: 447. 1928; Small, Man. Se.

Fl. 679. 1933. *C. Sagittatas* Hill, Veget. Syst. **21**: 10. pl. 10. fig. 1. 1772. *Anonymos sagittalis* Walt. Fl. Carol. 181. 1788. *C. parviflora* Roth, Catalect. Bot. **1**: 83. 1797; Willd. Sp. Pl. **3**(2): 973. 1803; Poiret, Encyc. Suppl. **2**: 400. 1811; Pursh, Fl. Am. Sept. 469. 1816; Elliott, Sketch **2**: 193. 1822; DC. Prod. **2**: 124. 1825; Beck, Bot. 77. 1833. *C. platycarpa* Link, Enum. Hort. Berol. **2**: 227. 1822; DC. Prod. **2**: 124. 1825. *C. lunulata* Rafinesque, New Fl. N. Am. **2**: 55. 1836. *C. pilosa* Rafinesque, New Fl. N. Am. **2**: 54. 1836, non Miller, Gard. Dict. ed. 8, No. 2. 1768, non Roxb. ex Mart. in Denkschr. Acad. Muench. **6**: 156. 1820, non Thunb. Prod. Pl. Cap. 125. 1800.—Type Locality: "Brasilia, Virginia." Distribution: Eastern and Central United States, Central America, the northern West Indies and South America.

This is an extremely variable species with a wide range and a definite tendency to become a weed in freshly disturbed habitats. At the extreme northern limits of its range the species is usually annual in habit but from Virginia southward both annual and perennial forms are found. The varieties set forth below are extremes in a large series of variations. Many intermediate forms occur and it is frequently difficult to determine precisely in which category they belong.

Key to the Varieties

Leaf-shape variable throughout the plant; lower leaves elliptic, upper lanceolate or linear-lanceolate; plant herbaceous to suffruticose.
Pods large (1.6–2.7 cm. long); plant erect, annual or perennial, 10 cm. or more high ..... Var. *typica.*
Pods small (0.7–1.5 cm. long); plant erect or slightly decumbent, annual, short, usually less than 10 cm. high .... Var. *Blumeriana.*
Leaf-shape relatively constant throughout the plant; leaves linear; plant suffruticose ..... Var. *fruticosa.*

Var. typica. Vermont: Vernon, *Blanchard s. n.* 1901. Massachusetts: Neponset, *Faxon s. n.;* Concord, *Williams s. n.*, dry sandy bank, Sept. 21, 1902; Winchester, shore of Winter Pond, *Bartlett 224;* Cape Cod, Nine Mile Pond, *Greenman 406;* Hampden Co., Southwick, *Seymour 230,* sandy knoll; Deerfield, *Day 6,* dry open field; Amherst, *Stabler s. n.*, July 24, 1886; Hyde Park, near Hazelwood on east of railroad, *Kennedy s. n.*, Aug. 3, 1909. Rhode Island: without locality, *G. L. s. n.*, 1844. Connecticut: Southington, *Andrews 330,* sandy soils; Middlefield, *Kofoid s. n.*, Aug. 9, 1888; Franklin, *Woodward s. n.*, dry sandy soil, July 3, 1906; Plainville, *Wright s. n.*, July 11, 1888; Bridgeport, *Eames s. n.*, sandy wastes, Sept 5, 1898. New York: Long Island, Nassau Co., Port Washington, sandy beach of Manhasset Bay, *Hopkins 323;* Harlem, *Thurber s. n.*, 1859. New Jersey: Sussex Co., Springdale, *Svenson 6726,* dry fields; Mickleton, *Heritage* (*Halstead's Am. Weeds 122*); Ocean Co., Lakewood, *Hunnewell 6925,*

sandy soil; Tuckahoe, *Killip 308*, roadside (US). PENNSYLVANIA: Easton, Chestnut Hill, *Porter s. n.*, Aug. 23, 1889; Bucks Co., Bristol, *Benner s. n.*, dry soil in gravel pit, Aug. 4, 1927; Chester Co., *Sharples s. n.*, July 1858–64; Williamson, *Keller s. n.*, July 22, 1892; Delaware Co., Wayne, *Bartram 1162*, dry gravel bank; Lancaster Co., mouth of the Tucquan, *Small s. n.*, Aug. 7, 1890 (US). MARYLAND: Anne Arundel Co., Pumphrey's Station, *Plitt 681;* Baltimore Co., Bare Hills, *Tidestrom & Bartlett 5207* (US); Catonsville near Baltimore, *Foreman s. n.* (NY); east of Pataxent River near Chesapeake Bay R. R. *Shull 226* (US). VIRGINIA: Northampton Co., Eastville, *Fernald & Long 5321, 5322*, dry sandy pine woods; Northampton Co., south of Kendall Grove, *Fernald, Long & Fogg 5320, 5323*, dry clearing bordering pine woods; Elizabeth City Co., West of Hampton, *Fernald, Long & Fogg 4888*, bushy clearings and borders of woods; Sussex Co., north of Littelton, *Fernald & Long 6228*, dry argillaceous field; Prince George Co., north of Baxter Crossing, *Fernald & Long 6230*, alluvial woods of Second Swamp; Alexandria Co., *Hunnewell 5495*, sandy shore of river; 2 miles northwest of Williamsburg, *Grimes 3910*, dry sandy soil along C & O right of way; east of Lightfoot, *Grimes 4095*, along railroad; hillside near mouth of Hunting Creek, *Vasey & Coville s. n.*, July 22, 1888 (US); Pittsylvania Co., Fall Creek, *Heller 1107*, alt. 585 ft. (US); Fairfax Co., Potomac Bluffs, *W. Palmer s. n.*, Aug. 13, 1899 (US); Luray, *N. L. & Mrs. Britton s. n.*, Aug. 31, 1885 (NY); Norfolk Co., Portsmouth, *N. L. & E. G. Britton & Vail s. n.*, July 3, 1892 (NY). NORTH CAROLINA: Caldwell Co., 1 mile southeast of Hudson, *L. F. & F. R. Randolph 1096*, dry soil, waste field; Swain Co., *Beardslee & Kofoid s. n.*, dry hills, alt. 2500 ft., July 28, 1891; Polk Co., near Columbus, Huston Place, *Townsend s. n.*, July 14, 1897 (US); Buncombe Co., Biltmore, French Broad River, *Biltmore Herb. 1622[a]*, sandy soil (US). SOUTH CAROLINA: Cherokee Co., Blacksburg, *House 2524* (US); Lexington Co., vicinity of Batesburg, *McGregor 306* (US); Oconee Co., no collector given, *1318* (NY). GEORGIA: Whitfield Co., *Harper 399*, dry woods, alt. 900 ft. (NY, US); De Kalb Co., *Harper 192*, dry sandy field, alt. 975 ft. (US); Catoosa Co., Catoosa Springs, *Bilt. Herb. 1622[c]*, dry soil (US); De Kalb Co., between Stone Mt. and Tricum, *Small s. n.*, alt. 1000 ft., July 20, 1893 (NY, US); Cobb Co., near Chattahoochee River, *Harper 6*, alt. 790 ft. (NY). FLORIDA: Lake Co., vicinity of Eustis, *Nash 1259;* southern Florida, *Chapman s. n.* (US); Otter Creek, *O'Neill s. n.*, low pineland, July 30, 1929 (US); Polk Co., Peace Creek, *J. D. Smith s. n.*, Apr. 2, 1880. INDIANA: Spencer Co., 2½ miles south of Lincoln City, *Deam 41623*, gravelly bar in small creek; Marshall Co., Lake Maxinkuckee, *Clark s. n.*, railroad, 1809 (US). WEST VIRGINIA: Hardy Co., Lost River Bridge, *Core 3722;* Jefferson Co., Harper's Ferry, *Core s. n.*, flood plain, Aug. 20, 1931 (NY). KENTUCKY: Lyon Co., Iron Hill, *Eggleston 4813* (NY); without locality, *Short s. n.* (NY). TENNESSEE: Henderson, *Bain 58*, thin dry soil; near West Tenn. Teacher's College, *Moore 37* (US);

Lincoln Co. Elora, *Bilt. Herb. 1622b*, dry soil in oak barrens (US); Knoxville, *Ruth 301*, sandy situation (NY); Knoxville, *Ruth 2224*, banks and along railroad (NY). Alabama: Bladon Springs, *Mohr s. n.*, July 2, 1859 (US); Lee Co., Ridge Grove, *Earle 866* (NY); Lee Co., Auburn, *Earle & Baker s. n.*, July 12, 1897 (NY); Huntsville, *Underwood s. n.*, May 29, 1896 (NY). Mississippi: Oktibbeha Co., Agricultural College, *Pollard 1266* (G, US); Starkville, *Tracy 2009* (NY); Summit, *Holt 32* (US); Biloxi, *Tracy 4446* (NY, US); Newtonia, *Phares 1701* (US). Minnesota: Afton, Lake St. Croix, *Butters s. n.*, sandy strand, Sept. 16, 1919 (NY); Lindstrom, *Anderson s. n.*, July, 1894. Wisconsin: Sauk Co., Spring Green, *Davis s. n.*, on railroad, July 9, 1930; Bridgeport, *Denniston s. n.*, Aug. 5, 1914. Iowa: Muscatine Co., *Pammel & Reppert 1255;* Coralville, *Somes 3572* (US). Illinois: Pope Co., Thatcher's Gap, *Gleason 157;* Champaign Co., Urbana, *Pease 12488*, along the Wabash railroad; Madison Co., *Eggert s. n.*, sandy ground, June 27, 1878; Beardstown, *Geyer s. n.*, dry clay, July, 1842; Pinckney Hills, *Benke 4631* (US). Missouri: Iron Co., Shepherd Mountain, *Greenman 3864;* Morgan Co., vicinity of Buffalo Mill, in Helly woods, *Demetrio 110;* Sivett Co., *Eggert s. n.*, Aug. 31, 1894; Swope Park, *Bush 7693*, barrens. Arkansas: Camden, *Fendler s. n.*, June 10, 1850; 25 miles north of Hot Springs, *Scully 329*, low creek bank; Fort Smith, *Bigelow s. n.* (US); Benton Co., *Plank s. n.*, 1899 (NY); Drew Co., Monticello, *Demaree 13684*, 271 ft. (NY). Louisiana: Calcasien Parish, Sulphur, *E. J. Palmer 7720*, dry open ground (US); near St. Martinsville, *Langlois s. n.*, Aug. 2, 1892 (US); St. Tammany Parish, 1 mile north of Abita Springs, *Pennell 4225*, dry pine land (NY); West Feliciana Parish, Catalpa, *Pennell 4302*, dry fields (NY); New Orleans, *Drummond s. n.*, 1832; without exact locality, *Torr. & Gray Fl. N. Am.* South Dakota: Clay Co., Vermilion, Missouri river, *Fisher 5006*, flood plain (US). Nebraska: Otoe Co., *T. J. & M. F. L. Fitzpatrick s. n.*, dry soil, Aug. 10, 1898 (NY, US). Kansas: Clay Co., Oak Hill, *Panton s. n.*, 1896; Onaga, *Crevecoeur 2* (US); Laurence, *Stevens s. n.* (US); Riley Co., *Norton 80*, ravines (NY). Oklahoma: Choctaw Co., Grant, *Houghton 4023*, sandy lake bank; Comanche Co., Cache, *Stevens 1324*, by mountain rivulet (G, US); Ottawa Co., Hattenville, *Stevens 2488*, on bank of sludge pond. Texas: Dallas, *Reverchon s. n.*, May 1875; Hempstead, *Hall 157, 158*, prairies, banks (G, US); Grapeland, *Tharp 815* (US); Harrisburg, *Bilt. Herb. 1622f*, sandy soil (US); Dalby, *Milligan s. n.*, dry hills, May, 1897 (US); Houston, *Fisher 5017* (US); Brazos Co., Bryan, *E. J. Palmer 12723*, sandy prairies (NY); San Augustine Co., San Augustine, *E. J. Palmer 12700*, sandy open ground (NY); Walker Co., Huntsville, *Dixon 331* (NY). Mexico: Sonora: Rio Mayo, San Bernardo, *Gentry 1325*, arroyo bank, turf, unusual low small-leaved form. Colima: Colima, *E. Palmer 130*, 1897 (US). Jalisco: Guadalajara, *Furness s. n.*, 1909 (F); near Chiapala, *Rose & Painter 7636* (NY). Tepic: Sierra Madre, between Santa Gertrudis and Santa Terresa,

Rose 2119 (US). Durango: *Garcia 942* (US). Puebla: Malinas, *Russell & Souviron 247* (US). Morelos: near Cuernavaca, *Rose & Painter 6850.* Guerrero: along Cuernavaca-Taxco road, 10 miles from Taxco, *MacDaniels 123*, moist pasture, elev. 5500 ft. (F). Oaxaca: near Oaxaca, floodplain of Rio Atoyac, *Camp 2590* (NY), unusual low small-leaved form. Chiapas: between Huitztan and Orchuc, *Seler 2145*, mountain forest, gravel and limestone; near San Cristobal, *Nelson 3202*, 7000–8000 ft. (US). Vera Cruz: Orizaba, *Botteri 351 B* (F); Mt. Orizaba, Cordoba, *Seaton 437*, 2700 ft. (G, US); Vera Cruz: *Purpus 8383* (US); La Purga, *Greenman 276* (F); near Jalapa, *Rose & Hough 4305* (US). British Honduras: All Pines, *Schipp 548*, 5 ft. alt., unusual narrow-leaved form similar to var. *fruticosa* (Mill.) Faw. & Rend. but annual and not suffruticose. Guatemala: Zacatepéquez, Santiago, *Gómez 1020*, 6500 pp. (G, US); Alta Verapaz, Coban, *von Türckheim II 1282* (US); Dept. Escuintla, Texcuaco, *Morales R. 1062*, alt. 150 m. (F); Praderas cerca Guatemala, *Tonduz 654*, 1400 m. (US), somewhat decumbent form; Praderas de Guatemala, *Tonduz 708* (US). Honduras: Dept. Santa Bárbara, San Pedro Sula, *Thieme 5186*, alt. 1000 pp. (US), much variation in amount and type of pubescence in some specimens resembling *C. Purshii;* Dept. Copan, Cuesta Arrancabarba, Hac. Espirita Santa to Quebrada Majanales, *Blake 7455* (US). El Salvador: vicinity of San Salvador, *Standley 19576*, shaded bank, alt. 650–850 m. Costa Rica: El Rodio, *Stork 1020*, sandy soil, roadside, 4600 ft.; summits about Nicoya, *Tonduz 13544* (US); Prov. Cartago, Cartago, *Cooper 5747* (US); Prov. Cartago, Dulce Nombre, *Standley 35824*, alt. 1400 m. (US); San José, *Tonduz 443, 1418*, pastures, 1135 m. (US); San José, *W. W. & H. E. Rowlee 262* (NY); Prov. San José, Cerro de Piedra Blanca, above Escasú, *Standley 32570* (US); Prov. San José, vicinity of Santa Maria de Dota, *Standley 41765*, alt. 1500–1800 m. (US); Concaras, *Lankester 318*, pastures (F); *Lankester K291*, pastures (F); Cerros de San Rafael de San Ramón, *Brenes 5899* (F); Collines de San Pedro de San Ramon, *Brenes 4337, 4958*, pastures, alt. 1000–1025 m. (F); Cauetera Alajuela Grecia entre los rios Pilas y Tacares, *Brenes 17296* (F); Alto de Acosta de San Ramón, *Brenes 1667s* (F); San Juan cerca de San Ramón, *Brenes 16847* (F). Panama: Canal Zone, Corozal, *Standley 27404*, weedy field (US). Cuba: without locality, *Wright s. n.*, 1860–64. Jamaica: Castleton, *Harris 11855*, gravelly bed of river, 490 ft. alt.; vicinity of New Castle, *Britton & Hollick 1767*, roadside, (NY), somewhat suffruticose but the leaves variable in shape as in the variety *typica;* Cedar Hurst to Silver Hill Gap, *Britton 344*, roadside (NY); Moody's Gap, *Britton 3416* (NY).

13a. C. sagittalis L. var. **Blumeriana**, var. nov. Herba erecta vel subdecumbens, annua pumila plerumque minus quam 10 cm. alta; leguminibus parvis, 0.7–1.5 cm. longis.—Arizona: Chiricahua Mts.: Wilgus Ranch, *Blumer 1772*, top of ridge, rock and soil, rhyolite, alt. 6000 ft. (type in the Gray Herbarium, isotype at the Field Museum

of Natural History); *Blumer 138*, rhyolite ridge, alt. 6000 ft. (US); Patagonia Mts., *Kearney & Peebles 10164* (US); near Fort Huachuca, *Wilcox 362* (US); near Patagonia Mts., *Harrison & Kearney 6041*, sandy soil; Huachuca Mts., *Harrison & Kearney 5794* (US). Mexico: Sonora: between Buloco and Santa Cruz, *Thurber 1062* (F, G). Chihuahua: pine plains at base of Sierra Madre, *Pringle 1222;* hills near Cusihuiriachic, *Pringle 1507;* Sierra Madre, 5 miles S. E. of Colonia Garcia, *Townsend 307*, 7500 ft. (NY); Sierra Madre near Colonia Garcia, *Townsend & Barber 307*, 8000 ft. (NY); Sierra Madre Occidental, south of Colonia Garcia, *Pennell 19164*, stony pineland, alt. 2100–2200 m. (US); Sierra Madre Occidental, Madera, *Pennell 19228*, stony pineland, alt. 2150–2200 m. (US); Sierra Madre, continental divide, Mex. N. W. R. R., ridge between Rio Chico and Rio Caballo, *Barlow s. n.*, Sept. 30, 1911 (F). Mexico: Temascaltepec, Palmar, *Hinton 5185*, hill, 650 m. (US); Lodiego, *E. Palmer 1607*, 1891 (G, US); Alamos, *E. Palmer 712*, 1890.

13b. C. sagittalis L. var. fruticosa (Mill.) Fawc. & Rend. Fl. Jam. **4**: 10. 1920. *C. fruticosa* Miller, Gard. Dict. ed. 8, 1768. ? *C. scariosa* Rafinesque, New Fl. N. Amer. **2**: 56. 1836. *C. Pringlei* A. Gray in Proc. Amer. Acad. **17**: 200. 1881–82.—Florida: near Jacksonville, *Curtiss 4702 A*, dry pine barrens (US). Alabama: Lee Co., Auburn, *Earle & Underwood s. n.*, May 16, 1896 (NY). Mississippi: Oktibbeha Co., Agricultural College, *Pollard 1266* (NY). Texas: Dallas, *Reverchon 2656*, common in sand (NY). Arizona: Santa Catalina Mts., *Pringle 276* (type of *C. Pringlei* A. Gray). Mexico: Jalisco: near Etzatlan, *Rose & Painter 7571* (US), *Pringle 8855*, mountain-side; the last two specimens cited as well as *Pringle 11807*, Mexico, without exact locality, are characterized by an extremely dense tawny to gray pubescence and perhaps constitute a local form. Sinaloa: San Ignacio, Quebrada del Agua Friá, *Montes & Salazar 764*, alt. 400 m. (US). Mexico: Acuapanzingo, near Cuernavaca, *Woronow & Juzepczuk 916* (F); Huasteca, Wartenberg near Tantoyuca, *Ervendberg 30.* Vera Cruz: Camarón, *Purpus 11077*, fields (F); Zacuapan, *Purpus 14052 b*, plains (F). Without locality: *Sessé, Mociño, Castillo & Moldonado 3754* (F). British Honduras: Honey Camp, coastal region, *Lundell 665* (F, NY, US). Guatemala: Los Amates, ½ mile south, *Deam 124*, prairie, alt. 160 ft. (G, NY); Guatemala, *Tonduz 654a* (US); without exact locality, *Heyde 195* (US). Honduras: Dept. Comayagua, vicinity of Siguatepeque, *Standley 56237*, 1080–1400 m. (US). El Salvador: Ahuachapán, vicinity of Ahuachapán, *Standley 19747*, alt. 800–1000 m.; vicinity of San Salvador, *Standley 22444*, sand along river, alt. 650–850 m. Nicaragua: San Rafael de Norte, *Miller & Griscom 57*, pine woods, 1200–1350 m. (US). Cuba: Pinar del Rio Prov., Herradura, *Earle 762*, fields (NY); Pinar del Rio Prov., vicinity of Herradura, *N. L. & E. G. Britton, Earle & Gager 6404*, royal palm savanna (NY). Jamaica: Gordontown to Cinchona, banks near Salt Hill Pond, *Britton 31* (NY);

Devon Pen, *Thompson 7973*, 300 ft. (NY); Tweedside, South St. Andrew, *Harris 6923* (G, NY, US), cited by Fawcett and Rendle as variety *typica* but the woody terete lower stems and the absence of stipules indicate that this specimen should be considered a small plant of variety *fruticosa;* St. Andrew, road to Salt Hill, *Harris 11965*, 3800 ft. alt. (G, US); Castleton, *Harris 11855*, 490 ft. (US). HAITI: Dept. du Nord, vicinity of St. Michel de l'Atalaye, l'Atalaye plantation, *Leonard 7451*, alt. 350 m. (NY, US); Massif de la Pelle, Petionville, Nouvelle-Touraine, Chap. Faure, *Ekman N. H. 1501*, 1400 m. (US); Massif du Nord, Carice, Lamielle, *Ekman N. H. 6191*, pinelands 450 m. (US). PUERTO RICO: Bayaman, *Sintenis 1093*, shore. ST. KITTS: near Sandy Point, *Britton & Cowell 128*, pastures (NY).

14. C. ANGULATA Miller, Gard. Dict. ed. 8, No. 9. 1768. *Anonymos rotundifolia* Walter, Fl. Carol. 181. 1788. *C. sagittalis* L. var. γ *ovalis* Michaux, Fl. Bor. Am. **2**: 55. 1803. *C. rotundifolia* Poiret, Encyc. Suppl. **2**: 402. 1811; Britt. & Brown, Ill. Fl. N. U. S. **2**: 268. fig. 2056. 1897; Small, Fl. Se. U. S. 602. 1903; Robins. & Fern. in Gray's Man. ed. 7, 507. 1908; Small, Man. Se. Fl. 679. 1933. *C. ovalis* Pursh, Fl. Am. Sept. 469. 1814; Elliott, Sketch **2**: 193. 1822; DC. Prod. **2**: 124. 1825; Hooker in Bot. Mag. **57**: t. 3006. 1830; Torr. & Gray, Fl. N. Am. **1**: 370. 1840; Chapman, Fl. S. U. S. ed. 3, 96. 1897. *C. procumbens* DC. Prod. **2**: 129. 1825, non Roxb. Fl. Ind. ed. 2, **3**: 278. 1832, non Wall. List. No. 5437. 1832. *C. ovalis* Rafinesque, New Fl. N. Am. **2**: 56. 1836. *C. pumila* Rafinesque, New Fl. N. Am. **2**: 56. 1836, non Ortega in Hort. Bot. Matrit. Dec. **2**: 23. 1797, non Blanco, Fl. Filip. ed. 2, 397. 1845, non Hochst. et Steudel ex Baker in Oliver, Fl. Trop. Afr. **2**: 17. 1871. ? *C. asarifolia* Rafinesque, New Fl. N. Am. **2**: 57. 1836. *C. Hookeriana* A. DC. in A. P. & Alph. DC. Mém. Soc. Phys. Hist. Nat. Genève **9**: 97. 1841. *C. leptoclona* Schauer in Linnaea **20**: 737. 1847.—TYPE LOCALITY: "sent me from Campeachy where the plant grows naturally" (Campeche, Mexico). DISTRIBUTION: Southeastern United States, Mexico, and Guatemala. VIRGINIA: Isle of Wight Co., near Walters, *Fernald & Long 6229*, dry sandy yellow pine and oak woods (G, US); Isle of Wight Co., south of Zuni, *Fernald & Long 6610*, open spots in sandy pine and oak woods; Nansemond Co., Suffolk, *Heller 936* (G, US). NORTH CAROLINA: Craven Co., 2 miles south of James City, *L. F. & F. R. Randolph 534*, dry sandy soil, open pine woods; Onslow Co., Dixon, *L. F. & F. R. Randolph 961*, dry sand; Onslow Co., Lake Catherine, *House 4536*, pine lands (US); Southern Pines, *Blankinship s. n.*, July 20, 1895; Brunswick Co., 3 miles west of Wilmington, *Wiegand & Manning 1507*, sandy dry pine woods; Wilmington, *Stevens 6* (US). SOUTH CAROLINA: Horry Co., Myrtle Beach, *Weatherby & Griscom 16556*, roadway, dry sandy pine barrens, golf club (G, US); Charleston, *Robinson 144*, sandy openings of pine woods near Navy Yard; Charleston Harbour, Mt. Pleasant, *J. D. Smith s. n.* Apr. 17, 1880 (US); Charleston Co., 14 miles south of Charleston near Clementia Tourist

Camp, *Moldenke 1202*, dry sandy fields (US); Charleston, *W. Palmer s. n.*, June 2–10, 1902 (US); Charleston Co., Christ Church Parish, Porchers Bluff, *Mearns 61* (US); Columbia, *Canby 18a;* St Andrews, *Hexamer & Maier s. n.*, field, May 19, 1855; Beaufort Co., Bluffton, *Bilt. Herb. 2108[g]*, sandy soil (US); vicinity of Florence, *J. D. Smith s. n.*, Aug. 2, 1884 (US); Colleton Co., w. of Fenwick, *Hotchkiss & Eknall 3879* (US). Georgia: near Augusta, *Bilt. Herb. 2108[i]*, sand hills (US); Sparta, *Bilt. Herb. 1622[e]*, dry soil (US). Florida: Apalachicola, *Bilt. Herb. 2108[a]*, dry pine barrens (US); Leon Co., near Tallahassee, *E. J. Palmer 35224*, moist sandy ground along creek; Leon Co., Tallahassee, *Nash 2325* (G, US); Alachua Co., near Alachua, *Wiegand & Manning 1511*, sandy oak woods; South Jacksonville, St. John's River, *Torrey s. n.* March, 1872; Jacksonville, *Curtiss 5662*, in part, dry or damp pine barren (US); Duval Co., *Churchill s. n.*, Apr. 8, 1897; Duval Co., *Fredholm 5135*, pine barrens (US); Dunnellon, *L. F. & R. Ward s. n.* Feb. 25, 1891; Gainesville, *Bottimer 481a* (US), unusually long-petioled form; Gainesville, *Miller 392* (US); Orange Co., Clarcona, *Pieters 408* (US); Hillsboro Co., *J. D. Smith s. n.* Apr. 5, 1880 (US); between Cutler and Longview Camp, *Small & Carter 861*, pinelands near homestead road (NY); Cedar Keys, *J. D. Smith s. n.*, Mar. 7, 1880 (US). Alabama: Antanga Co., Hugger's Reservation, *Caperius s. n.*, borders of woods; Henry Co., 8 miles north of Abbeville, *Wiegand & Manning 1513;* Mobile, collector not given, May 9, 1839; Spring Hill, *Mackenzie 4027*, dry pine woods; Spring Hill, *Bush 47*, woods (NY, US); Mobile Co., Springhill, *Mohr 246*, dry sandy pine hills (US); Tallapoosa Co., *Earle s. n.*, Aug. 30, 1897 (NY); Lee Co., Auburn, *Earle & Baker 827* (NY); Auburn, *Lloyd & Earle s. n.* Sept. 1900 (NY); Chilton Co., Verbena, *E. A. Smith s. n.*, Aug. 22, 1874 (US). Mississippi: Ocean Springs, *Tracy 4447* (G, US); Long Beach, *Joor s. n.* wooded sand hill, July 21, 1891 (NY); Harrison Co., Biloxi, *Pollard 1052* (G, US); Harrison Co., Biloxi, west of bay, *Pennell 4385*, dry sandy pine land (NY); Beauvoir, *Tracy 4443, 4449, 4450* (US); Meridian, *Bilt. Herb. 2108[h]*, hillsides (US). Louisiana: New Orleans, *Drummond 77;* without exact locality, *Torrey s. n.* (Torr. & Gray, Fl. N. Amer.); St. Tammany Parish, 1–2 miles north of Abita Sorings, *Pennell 4257*, open pine land (NY). Mexico: Sinaloa: San Ignacio, Rancho del Agua Fria, *Montes & Salazar 693*, alt. 310 m. (US). Jalisco: near Guadalajara, *Safford 1397* (US); Sierra Madre, San Sebastian, Trail to Las Mesitas, *Mexia 1863*, 1700 m. (F, US); near Guadalajara, *Rose & Painter 7329* (US); vicinity of Jalisco, *Ferris 5834*, exposed roadside bank (US). Nayarit: east of Tepic, Cerro de la Cruz, *Mexia 663*, open thicket, 1000 m. (US); Tepic, *E. Palmer 2015*, 1892 (US); Tepic, *Jones 23036* (F). Federal Dist.: Santa Fé, *Pringle 9624* (US); Pedregal de San Angel, *Lyonnet 109* (NY, US); Xochimulco, *Orcutt 4353* (F). Mexico: dist. Temascaltepec, Comunidad, *Hinton 2454*, pine forest, alt. 2750 m. (US); Valley of Mexico, Santa Fé, *Bourgeau 574* (G, US); near Tlalpam,

Rose & Hough 4531 (US). Michoacan: Morelia, *Arsène 6834* (US). Morelos: Alarcan, *Rose & Hay 5315* (US). Puebla: vicinity of Puebla, *Arsène 1414* (US); vicinity of Puebla, Santa Barbara (Alsereca), *Arsène 10010*, 215 m.; vicinity of Puebla, between Santa Barbara and Cristo, *Arsène 10013*. Oaxaca: Sierra de San Felipe, *C. L. Smith, 328*, alt. 7000–8000 ft. (US); valley of Oaxaca, *Nelson 1481*, alt. 5500–7500 ft. (G, US). Vera Cruz: Orizaba, *Botteri 351 A* (F); *Müller 1587* (NY): Misatlanta, *Purpus 5907* (F, G, NY, US); near Jalapa, *Rose & Hay 6165* (US); near Jalapa, *Rose & Hough 4305* (US). Campeche: photograph of the TYPE of *C. angulata* Miller (British Museum). Salto de Agua, *Purpus 1747*, dry open woods (US); without exact locality, *Sessé, Mociño, Castillo & Moldonado 1909, 1922, 1926, 3703* (F). GUATEMALA: Dept. Zacatepequez, Santiago, *Gomez 1020*, 6500 pp. (US).

A photograph of the type of *Crotalaria angulata* Mill. from the herbarium of the British Museum clearly shows that this is the valid name for the species which has recently passed as *C. rotundifolia* (Walt.) Poir. Miller's description (Gard. Dict. ed. 8, No. 9. 1768) differs somewhat from his specimen, especially in the statement that "the flowers are produced singly from the side of the branches" whereas the photograph of Miller's specimen shows one peduncle which clearly bears two or perhaps three flowers. The description also states "this [*i. e.* the plant] rises with a taper upright stalk near three feet high, dividing upward in several hairy branches which grow erect." The entity which has been known as *C. rotundifolia* probably seldom exceeds a foot and a half in height and is a spreading plant with erect-ascending branches. The plant is described by Miller as annual while *C. rotundifolia* is probably always perennial. These discrepancies may in part be accounted for by Miller having based his description on plants grown in the greenhouse in England.

On the positive side the leaf-shape and size of Miller's type check very well with the Mexican specimens cited above. This leaf-shape, associated with the spreading pubescence of the stems (which is clearly shown in the photograph and stated in Miller's description), is a distinctive combination of characters which make this a fairly well defined species. The leaf-apex of the Mexican material, including the type, tends to be slightly acuminate, while in the material from the United States the apex frequently is blunter and more nearly obtuse. But the distinctions are not sufficient to warrant varietal separation.

The procumbent habit, oval to orbicular leaves, shaggy pubescence and relatively many-flowered racemes make this a distinct species

within the complex American group of simple-leaved species. Much of the material from Central America which has been identified as this species is in reality *C. Tuerckheimii*. It is possible that the reports of the species from South America are also based on similar material. The specimens cited above indicate the presence of *C. angulata* throughout much of Mexico. The plate and Hooker's description appearing in Curtis' Botanical Magazine (**57**: t. 3006. 1830) were prepared from plants grown from Mexican seed. Similarly DeCandolle's *Crotalaria procumbens*, Prod. **2**: 129. 1825, was based on a drawing of Mociño made from a Mexican plant (Calq. Dess. Fl. Mex. Mociño et Sessé, t. 227. 1874). Hooker's plate (Bot. Mag. **57**: t. 3006. 1830) on which *C. Hookeriana* A. DC. was based shows an erect plant rather than a procumbent one. But the leaf-shape, and especially the peduncles with several flowers rather than about three indicate that the species is conspecific with *C. angulata* Mill. rather than *C. Tuerckheimii* Senn.

15. C. Pursh DC. Prod. **2**: 124. 1825; Torr. & Gray, Fl. N. Am. **1**: 370. 1840; Chapman, Fl. S. U. S. ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Robins. & Fern. in Gray's Man. ed. 7, 507. 1908; Small, Man. Se. Fl. 679. 1933. *C. sagittalis* L. var. β. L. Sp. Pl. 714. 1753; Lamarck, Encyc. **2**: 195. 1786; Willd. Sp. Pl. **3**(2): 973. 1803, in part. *C. laevigata* Pursh, Fl. Am. Sept. 469. 1814, non Lamarck, Encyc. **2**: 198. 1786. ? *C. longipes* Rafinesque, New Fl. N. Am. **2**: 54. 1836. *C. cuneifolia* Rafinesque, l. c. 55. *C. linearis* Rafinesque, l. c. 55.—Type Locality: "in pine-woods of Virginia and Carolina." Distribution: Southeastern United States, Mexico and Guatemala. Virginia: Nansemond Co., Suffolk, *Heller 1107;* Nansemond Co., Suffolk, *Blankinship s. n.*, July 13, 1895; Isle of Wight Co., 1 mile southeast of Zuni, *Fernald & Long 6233*, dry sandy pine and oak woods; Dinwiddie Co., near Carson, *Fernald, Long & Smart 5805*, border of dry sandy woods. North Carolina: Weldon, *Canby s. n.*, July 1, 1878; Pasquotank Co., 2 miles southeast of Elizabeth City, *Wiegand & Manning 1495*, sandy roadside; Beaufort Co., 8 miles north of Washington, *Wiegand & Manning 1496*, sandy roadside by woods; Bladen Co., *Bilt. Herb. 1317*, pine barrens (US); Bladen Co., Clarkton, *Bilt. Herb. 1317*^{b}, pine barrens (US); Chowan Co., Edenton, *Kearney 1905* (US); Cumberland Co., Fayetteville, *Bilt. Herb. 1317*^{e} (US). South Carolina: Florence Co., 2 miles north of Lake City, *Wiegand & Manning 1500*, mucky open sandy thicket; Jasper Co., 2 miles north of Coosawhatchie, *Wiegand & Manning 1501*, moist sandy thicket; Summerville, *Hexamer & Maier s. n.*, open pine woods, May 24, 1855; Hartsville, *Norton s. n.*, edge of sand hills, sandy slopes, open woods, July 8, 1920 (US); Aiken, *H. W. R. s. n.*, June, 1869 (US);

Oconee Co., Keowee, *House 2204* (US), approaching *C. maritima* Chapm. GEORGIA: McIntosh Co., ½ mile northeast of Townsend, *Wiegand & Manning 1504*, dry sandy pine barrens; Fort Pulaski, *Stewart s. n.;* Bullock Co., *Harper 857*, dry pine barrens, Eocene overlaid by Lafayette and Columbia (US); Habersham Co., between Tallulah Falls and Toccoa Falls, *Small s. n.*, alt. 1000–1700 ft., Aug. 8, 1893 (NY); Worth Co., vicinity of Poulan, *Pollard & Maxon 558* (US); without exact locality, *Mrs. Naylor s. n.* FLORIDA: Lee Co., Punta Rossa, *Hitchcock 62*, strand; Lee Co., Myers, *Hitchcock 64, 65*, moist grassy places; Lee Co., vicinity of Marco, *Standley 12712, 12772*, pine woods, (US); Orange Co., Lanford, *Pieters 314* (US); Orange Co., Clarcona, *Pieters 64* (US); near Jacksonville, *Curtiss 533* (G), *543* (US), *4219* (US), *4753* (G, US), dry pine barrens; Duval Co., South Jacksonville, San Pablo, *Churchill s. n.*, April 14, 1897; Duval Co., *Fredholm 5197*, pine barren (G, US); near Apalachicola, *Bilt. Herb. 1317c*, grassy pine barrens (G, US); Lake Co., Eustis, *Nash 26*, high pine land; Brevard Co., Okeechobee region, *Fredholm 5931*, dry pine barren; Hillsboro Co., Tarpon Springs near Tampa, *Churchill s. n.*, sand barrens, Mar. 23, 1923; Sarasota Bay, mouth of the Manatee River, *Rugel 183*, sandy places near sea shore; Dade Co., west of Fulford, *Moldenke 5659*, dry sandy soil along roadside (NY); John's Pass, *Tracy 7792* (G, US); without exact locality, *Chapman Herb. s. n.* (G, US). TENNESSEE: White Cliff Springs, *Scribner s. n.*, July 1890 (US). ALABAMA: Atmore, *Blanton 254*, in high pineland; Gateswood, *Tracy 8693* (G, US); Mobile, no collector given, May 6, 1839; Buckley, *Sartwell s. n.* (US); Springhill College, Caliohi, *Mohr s. n.*, July 23, 1892 (US); Mobile, *Mohr s. n.*, pine barrens, May 20, 1879 (US); near Spring Hill, *Graves 569 B* (US), extreme narrow-leaved form. MISSISSIPPI: Jackson Co., Ocean Springs, *Pollard 1072* (NY, US), extreme narrow-leaved form; Biloxi, Horn Island, *Tracy 1994, 2005* (NY); Biloxi, *Tracy & Lloyd 188* (US), extreme narrow-leaved form; Nehoutieabooffe, *Tracy 4440* (US), narrow-leaved form; Beauvoir, *Tracy 4441, 4442* (US); Koshtaw, *Tracy 4444* (US). LOUISIANA: New Orleans, *Drummond 75;* vicinity of Covington, *Ancct 50* (US); vicinity of Covington, *Arsène 12342* (NY), *12344* (US); New Orleans, *Ingalls s. n.*, 1834 (NY). TEXAS: Trinity, *Tharp 808* (US); Tarrant Co., *Killiam 6986* (US); Prairies of the Rio Grande, *Meyer s. n.*, 1844 (NY); without exact locality, *Wright s. n.* MEXICO: Nayarit: Tepic, *E. Palmer 1869*, 1892 (NY, US). Jalisco: Sierra Madre Occidental, San Sebastian west to Mascata, *Mexia 1408*, pine woods on steep hillside, 1425 m. (US).

This species has distinctly appressed pubescence in contrast to the spreading pubescence of *C. sagittalis* L. which it closely resembles. In the northern part of the range there is considerable variation in leaf-shape on individual plants, the lower leaves being oblong-elliptic or even obovate with more or less obtuse apices, the upper being

linear-lanceolate. In contrast in material from Florida, Alabama and Mississippi most of the leaves are linear-lanceolate.

15a. C. Purshii DC. var. **polyphylla** (Riley) comb. nov. *C. polyphylla* Riley in Kew Bull. **1923**: 333. 1923. *C. quercetorum* Brandegee in Univ. Calif. Publ. Bot. **10**: 407. 1924.—Mexico: Sonora: Sierra Charuco, Pinal, *Gentry 1692*, open slopes, upper Sonoran (F, G). Chiapas: Hacienda Monserrate, *Purpus 9144* (F, G, NY, US, isotypes of *C. quercetorum* Brandegee). Vera Cruz: Tlacomitla, *Purpus 13016*, rocky plains (F, NY). Guatemala: Santa Rosa, Cerro Gordo, *Heyde & Lux 3731*, alt. 3500 pp. (G, US); Chimaltenango, Alameda, *Johnston 14* (F); Alta Verapaz, Coban, *von Türckheim II 2016*, 1600 m. (F, US).

This variety differs from the type of the species by the stipules being entirely absent or, when rarely present, minute, and by the short-petioled, mostly linear, leaves. The variety *polyphylla* is annual in contrast to *C. Purshii* var. *typica* which is usually perennial. No stipules are present on the collections of *Purpus 9144* and of *Heyde & Lux 3731* but the collection of *Gentry 1692* has minute setaceous decurrent stipules at a few of the uppermost nodes. The slight variation in development of stipules is similar to that found throughout this group of species. The type of *C. polyphylla* Riley has not been seen but the description checks very well with the material examined. *Gentry 1692* shows the lower stem where the leaves have fallen and illustrates the nodular condition which Riley considered to be especially characteristic of his species. Brandegee regarded *C. quercetorum* as closely related to *C. sagittalis* L. This is of course correct in such an intimately related group of species, but the closely appressed pubescence of the entity under consideration associates it with *C. Purshii* DC. more closely than with *C. sagittalis* L.

16. C. maritima Chapman, Fl. S. U. S. ed. 2, Suppl. 614. 1883; ed. 3, 96. 1897; Small, Fl. Se. U. S. 602. 1903; Small, Man. Se. Fl. 679. 1933. *C. rotundifolia* var. *brachytricha* Sprague & Riley in Kew Bull. **1923**: 334. 1923.—Type Locality: "sandy beach at Palm Cape, South Florida." Distribution: Southeastern United States, Mexico and Puerto Rico. Georgia: Isle of Hope near Savannah, *Bilt. Herb. 2108c* (US); Savannah, *Bilt. Herb. 2108d*, sandy soil (US). Florida: Jacksonville, *Curtiss 4702 B*, dry sandy pine barrens (A, US); near Jacksonville, *Curtiss 4218* (US); near Jacksonville, *Curtiss 532*, dry pine barrens (US); Duval Co., Jacksonville, *Faxon s. n.* April 8, 1885; Duval Co., *Fredholm 5135*, pine barren; Orange Co., Sanford, *Pieters s. n.*, Aug. 23, 1899 (US); Orange Co., *Fredholm 5444*, dry pine barren; Orange Co., Winter Park, *Canby s. n.*, in part, dry sand, Feb.

1889; Lee Co., vicinity of Fort Myers, *Standley 12537*, pine woods (US); Lee Co., Punta Rossa, *Hitchcock 62*, strand (G,US); Lee Co., Owanita, *Kellogg s. n.*, about Mar. 18, 1907; St. John Co., near St. Augustine, Anastasia Isl., *Rugel 185;* St. John Co., near St. Augustine, *Rugel 184*, pine woods; Osceola Co., Kipimmee, *Mearns s. n.*, May 7, 1901 (US); Kissimmee Prairie, *Mearns s. n.*, April 25, 1901 (US); Escambia Co., *Bilt. Herb. 2108[e]*, sandy soil (US); Palatka, *Garber s. n.*, Feb. 1876 (US); Hillsborough Co., *Fredholm 6290*, dry sandy soil; Volusia Co., Ormond, *Fuller s. n.*, Mar. 2, 24, 1904, pineland; Palm Beach Co., Port Sewall, *Hunnewell 7344* (in part), pine barrens; Manatee Co., Manatee, *Garber s. n.*, March, 1878 (G, US); Brevard Co., Okeechobee region, *Fredholm 6440*, dry pine barren; Lake Co., near Eustis, *Hunnewell 8682*, dry oak woods; Columbia Co., Lake City, *Straub 14;* Dade Co., pinelands about Addison Hammock, *J. K. & G. K. Small 6623* (NY); Sanibel Island, *Tracy 7789* (in part) (G, US); No Name Key, *Simpson 534* (in part), dry pine woods; Ybor, *L. F. & R. Ward s. n.*, Mar. 1, 1891 (US); without locality, *Chapman s. n.* (G, US); Pine Key, *Blodgett s. n.* (in part); Cape Sable, *Curtiss 182*, sandy field. ALABAMA: Horn Isl. *Baker 689* (NY). MISSISSIPPI: Biloxi, *Tracy 2003, 2004, 2007, 2008* (NY). LOUISIANA: Mississippi delta, Cat Island, *Lloyd & Tracy 182* (NY, US) *240* (NY). MEXICO: Nayarit: Tepic, Sierra Madre, *Rose 3450* (US); Sierra Madre, near Santa Terresa, *Rose 2174* (US). Chihuahua: Sierra Gazachi, 35 km. southeast of Minaca, Barranca Colorado, *Pennell 18962*, rocky mountain slope, 2300–2500 m. (US); Mesa de Basaseachio, *LeSueur 689* (F); Sierra Madre, Arroyo Aucho, *Pringle 1223*, pine flats (G, NY, US). Durango: Otinapa, *E. Palmer 398*, 1906 (NY, US); *Palmer 395* (F); *Garcia 384* (US); Sierra Madre Occidental El Salto (Aserraderos), *Pennell 18357*, rocky pineland, 2570–2800 m. (US). Oaxaca: vicinity of La Parada, *Nelson 1014*, alt. 7500–8500 ft. (US); Sierra de San Felipe, *C. L. Smith 328*, 7000–8000 ft. (NY). PUERTO RICO: vicinity of Dorado, *N. L. & E. G. Britton & M. S. Brown 6653*, white sand (F, NY, US).

This species is distinguished by its thick fleshy root, procumbent habit, appressed pubescence, and elliptic-ovate to linear leaves. It is related on the one hand to *Crotalaria angulata* Miller and on the other to *C. Purshii* DC. The form in which all the leaves on the plant tend to be linear, which has been known as *C. Linaria* Small, is reduced to varietal status.

16a. C. MARITIMA Chapman var. **Linaria** (Small) comb. nov. *C. Linaria* Small, Man. Se. Fl. 679. 1933.—FLORIDA: Eustis, *Bilt. Herb. 1317[d]*, sandy soil (US); Orange Co., Winter Park, *Canby s. n.* (in part), dry sand; Hillsborough Co., Dunedin, *Tracy 6884* (G, NY, US); Monroe Co., Big Pine Key, *Small & Mosier 6034*, hammocks (NY, TYPE of *C. Linaria* Small); Monroe Co., No Name Key, *Small*

7447, pinelands (NY); Monroe Co., Big Pine Key, *Small 8156*, pinelands (NY); Monroe Co., Big Pine Key, *Moldenke 818*, dry sandy pineland (US) (some specimens are intermediate between var. *Linaria* and var. *typica*); Tarpon Springs, *Beckwith 657* (US); Shell Island, *Tracy 7793* (NY, US); Eau Gallie, *Curtiss 6109*, grassy field (US); Merritts' Island, *Baldwin s. n.*, May, 1893 (NY); between Cocoanut Grove and Cutler, *Small & Wilson 1901*, pinelands (NY); Ft. Lauderdale to Miami, *J. K. Small, Carter & G. K. Small 3367*, pinelands (NY); Miami, *Britton s. n.* April 1, 1903 (NY); Seminole, *Tracy 7791* (NY); Sanibel Island, *Tracy 7789* (in part) (G, US); Pine Key, *Blodgett s. n.* (in part); Palm Beach Co., Port Sewall, *Hunnewell 7344* (in part), pine barrens.

Section Eucrotalaria Baker f.

17. C. **Urbaniana**, nom. nov. *C. anisophylla* Urban, Symb. Antill. **9**: 448. 1928, non Welw. ex Hiern, Cat. Welw. Afr. Pl. **1**: 195. 1896; Baker f. in Journ. Linn. Soc. **42**: 260. 1914.—Type Locality: Cuba, "Oriente, Bayamo, on edge of Rio Bayamo." Distribution: Known only from the type locality. Cuba: Oriente, Bayamo, on edge of Rio Bayamo, *Ekman 16197* (Botanical Museum, Stockholm), type of *C. anisophylla* Urban.

The specimen on which this species is based has a somewhat abnormal appearance as if it may have been injured at some time during its development. The characters by which it is distinguished (the variation in number of leaflets from one at the base of the plant to three at the top of the plant) are so unmistakable that it seems advisable to admit it as a valid species until such time as more material is available. In the three large herbaria examined and in the large loan of material from the Field Museum no sheets were found to match this specimen from eastern Cuba. As noted above Urban's specific epithet is preoccupied, necessitating a new name for the species.

18. C. quinquefolia L. Sp. Pl. 716. 1753; DC. Prod. **2**: 135. 1825; Fawc. & Rend. Fl. Jam. **4**: 12. 1920; Merrill, Enum. Philip. Pl. **2**: 273. 1923; Urban, Symb. Antill. **9**: 448. 1928. Type Locality: "India." Distribution: India, Malay Archipelago, Philippines to Australia; introduced in the West Indies. Cuba: Oriente, Sierra de Nipe, Woodfred, *Ekman III 10143* (NY). Barbados: St. Michael, near entrance to Bush Hall, *Bovell 58* (NY). Guadeloupe: Capesterre, savanna near the seashore, *Duss 4025* (F, NY). Martinique: vicinity of St. Pierre, *Duss 1108* (NY); near Saint-Pierre, *Duss s. n.*, 1882 (NY).

This is an Old World species, locally introduced in the West Indies and very easily distinguished by its 5-foliolate leaves and large flowers and pods.

19. C. LOTIFOLIA L. Sp. Pl. 715. 1753 (by error spelled *latifolia*); DC. Prod. **2**: 134. 1825; Grisebach, Fl. Brit. West Ind. 180. 1859; Duss, Fl. Phan. Antill. Fr. 193. 1897 (Ann. Inst. Colon. Marseille **3**: 193); Urban, Symb. Antill. **4**: 281. 1905 (Fl. Portoricensis), Symb. Antill. **8**: 279. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. **4**: 11. 1920, non *Crotalaria lotifolia* Poeppig ex Steudel, Nomencl. ed. 2, **1**: 443. 1840, non *Crotalaria lotifolia sensu* Baker in Oliver, Fl. Trop. Afr. **2**: 42. 1871.—TYPE LOCALITY: "in Jamaica." DISTRIBUTION: West Indies and locally in Yucatan and Honduras. MEXICO: Yucatan: no locality, *Gaumer 24264* (F). HONDURAS: Swan Islands, *Nelson 44*, clearings (G, NY). CUBA: Camaguey, vicinity of Tiffin, *Shafer 2891* (NY); Santiago Prov., vicinity of Santiago City, *Pollard, E. & W. Palmer 268*, 1902; Santiago, "The Ovens," *Millspaugh 1119, 1125* (F); Santiago, *Havard 85* (NY); Oriente, vicinity of Santiago, Santiago Harbour, *Britton 1882*, hillsides (NY); vicinity of Santiago, *N. L. & E. G. Britton & Cowell 12915*, wooded hills (NY); Antilla, *N. L. & E. G. Britton & Cowell 12441*, woodlands (NY); near Santiago, *Ekman III 7761*, in shrubbery (NY); Cuba Orientali, *Wright 118;* Cuba Orientali, *Wright 1589*, shaded hillsides; Oriente, Valley of Rio Matamoros, south of Holguin, *Shafer 1345*. JAMAICA: without exact locality, *Purdie s. n.;* Great Goat Island, *Harris 12520;* Great Goat Island, southeastern side, *Harris 9323* (NY); Lower Clarendon, Inverness, *Harris 12723;* Santa Cruz Mts., Potsdam to Pedro Plain, *Britton 1204*, wooded hillside (NY). PUERTO RICO: eight miles west of Ponce, *Heller 6273*, low ground along the coast (A, G); near Guanica, Mt. Alba, *Sintenis 3581*, shrubbery; near Ciamo, *Sintenis 2989 b*, shrubbery at the river.

This and the following closely related species, *C. Purdiana* Senn, are American members of the subsection *Oliganthae* Baker f. They are distinguished from the other species of the Section *Eucrotalaria* by the basally attenuated pods and by the short axillary inflorescences. *Crotalaria lotifolia* is a shrubby species up to 2 metres in height, which occasionally assumes a somewhat scandent habit. In the region under consideration it is limited in distribution to the West Indian Islands with the exception of stations in Yucatan and Honduras.

There are two distinct entities within the species. The type has not been seen but the Jamaican material just cited matches fairly well Sloane's plate (Nat. Hist. Jam. **2**: 33, t. 176 f. 1. 2. 1725), which is cited by Linnaeus. Sloane describes the leaflets as three-quarters of an inch (1.8 cm.) long and half as broad. In the specimens cited the leaflets range from 1.5–5.4 (av. 2.5–3.5) cm. long and 0.7–2.1 (av. 1.0–1.6) cm. wide. They are usually elliptic-acuminate, and semi-cuneate at the base. The flowers in these specimens are large (1.3–1.7

cm. long). The second entity has smaller obovate-elliptic leaves usually with obtuse or retuse apices. The flowers are also somewhat smaller than those of the specimens cited above. This is a new variety.

19a. C. LOTIFOLIA L. var. **Eggersii**, var. nov., a varietate typica differt foliis minoribus, 2.0–4.0 (saepissime 3.2–3.7) cm. longis, foliolis 0.9–1.7 (saepissime 1.2–1.4) cm. longis, 0.5–0.7 cm. latis, obovatis, apice obtusis vel retusis; floribus minoribus, 1.1–1.3 cm. longis.—BAHAMA ISLANDS: New Providence, *Brace 419* (NY); Eleuthera, Rock Sound and vicinity, *Britton & Millspaugh 5569* (NY). CUBA: Camaguey, Cayo Romano, vicinity of Pueblo Romano, *Shafer 2478* (G, NY); Camaguey, Cayo Paloma, *Shafer 2572* (G, NY). PUERTO RICO: Vieques Island, Ensenada Honda to Puerto Medio, *Shafer 3016* (NY); Vieques Island, Cabaza to Ensenada Honda, *Shafer 2944*, ravine (NY); near Guayanilla, *N. L. & E. G. Britton 9342*, sea beach (NY). ST. THOMAS: St. Thomas, *Eggers 130* (TYPE in the Gray Herbarium); Water Island and St. Thomas, Banana Bay, *Eggers s. n.*, strand, Aug. 20, 1876. BRITISH VIRGIN ISLANDS: Anagada, *Fishlock 1*, roadsides and near abandoned cultivations; Virgin Gorda, North Sound, *Fishlock 23*, roadsides and banks (NY). ST. JAN: *Britton & Shafer 512*, rocky hillside (NY). ST. CROIX: Christiansted, hill near town, *Rose, Fitch & Russell 3620* (NY).

20. C. PURDIANA Senn in Journ. Bot. **76**: 298. 1938.—TYPE LOCALITY: Colombia, Santa Marta. DISTRIBUTION: Santa Marta, Colombia and Habana Province, Cuba. CUBA: Habana Prov., Batabano, *Ekman 12621*, in palm savannas behind the manglares (F). COLOMBIA: Santa Marta, Manocapa, *Purdie s. n.* Sept. 1844 (TYPE in the Gray Herbarium, ISOTYPE in the herbarium of the Royal Botanic Gardens, Kew).

This species is closely related to *C. lotifolia* L. but may be separated from it by the axillary racemes bearing 4–8 flowers rather than 1–3, as in *C. lotifolia*, and by the leaves being hirtellous on the upper surface, rather than glabrous as in *C. lotifolia* L.

21. C. INCANA L. Sp. Pl. 716. 1753; Jacquin, Obs. Bot. t. 82. 1771; Cavanilles, Ic. **4**: t. 322. 1797; Grisebach, Fl. Brit. West Ind. 180. 1859; Duss, Fl. Phan. Antill. Fr. 192. 1897 (Ann. Inst. Colon. Marseille **3**: 192); Chapman, Fl. S. U. S. ed. 3, 97. 1897; Small, Fl. Se. U. S. 602. 1903; Urban, Symb. Antill. **4**: 281. 1905 (Fl. Portoricensis), Symb. Antill. **8**: 279. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. **4**: 11. 1920; Rock, Legum. Plants Hawaii 137. pl. 60. 1920; Small, Man. Se. Fl. 680. 1933. *C. purpurascens* Lamarck, Encyc. **2**: 200. 1786. *C. pubescens* Moench, Meth. 161. 1794. *C. hirta* Lagasca, Gen. Sp. Nov. 22. 1816, non Willd. Neue Schrift. Ges. Naturf. Fr. Berlin **4**: 217. 1803, non Roth, Nov. Pl. Sp. 339. 1821. *C. affinis* DC. Prod. **2**: 132. 1825. *C. cubensis* DC. Prod. **2**: 131. 1825. *C. setifera* DC. Prod. **2**: 131. 1825. *C. diffusa* Vellozo, Fl. Flum. 307. 1825, Ic. Fl. Flum. 7. t. 110. 1827.

C. herbacea Schweigger in Schrank, Syll. Ratisb. **2**: 77. 1828. *C. Schimperi* A. Richard, Tent. Fl. Abyss. **1**: 151. 1847. *C. montana* A. Richard, Tent. Fl. Abyss. **1**: 152. 1847. *C. eriocaula* Schauer in Linnaea **20**: 738. 1847. *Crotalaria radiata* Merrill in Phil. Journ. Sci. Bot. **5**: 63. 1910. *Chrysocalyx Schimperi* Hochst. in Schimp. Pl. Abyss. No. 394, fide A. Richard, Tent. Fl. Abyss. **1**: 151. 1847 and Baker f. in Journ. Linn. Soc. **42**: 357. 1914.—TYPE LOCALITY: "in Jamaica & Caribaeis." DISTRIBUTION: Tropical and warm temperate America, the Philippines, Hawaii, Java, India and Africa. FLORIDA: Lee Co., Punta Rossa, *Hitchcock 61*, waste places (G, US); Lee Co., vicinity of Fort Myers, *Standley 18972* (US); Hillsborough Co., *Fredholm 6408*, sandy field (G, US); Indian River, *Curtiss 530*, rich soil (G, US); Manatee Co., Palmetto, *Nash 2461* (G, US); Biscayne Bay, *Palmer 98;* Biscayne Bay, *E. Palmer s. n.* 1874 (NY); Terra Cieca Bay *Rugel 186*, sea shore; Cape Florida, *Curtiss 5476* (G, US); Caximbas Pass, *Chapman s. n.;* Miami, *Garber s. n.*, May, 1877 (G, US); Miami, *Tracy 9101* (G, US); Mondongo Island, *Tracy 7720* (G, US); southern Florida, *Chapman 802* (US); Sneeds' Island, *Tracy 6338* (US); Dade Co., Addison Hammock, *Small 7478* (NY); Monroe Co., Cape Sable (East Cape), *Small 8029*, sand dune (NY); Cutler, Deering Hammock, *Small 8529* (NY); Clearwater, *Huger s. n.*, Jan.–Feb. 1902 (NY); Miami, *Small & Carter 1195*, pinelands (NY). ALABAMA: Mobile, *Mohr s. n.*, ballast ground, Oct. 28, 1891 (US). TEXAS: Brazos Santiago, *Nealley 79* (US). MEXICO: Lower California: San José del Cabo, *Anthony 346.* Sonora: Rio Mayo, San Bernardo, *Gentry 1306;* vicinity of Alamos, *Rose, Standley & Russell 13023* (US). Chihuahua: near Batalopos, Hacienda San Miguel, *E. Palmer 109.* Sinaloa: Mazatlan, Isla Piedra, *Lamb 362;* San Ignacio Los Candeleros, *Montes & Salazar 761* (US). Nayarit: Acaponeta, *Lamb 527;* vicinity of Acaponeta, *Rose, Standley, & Russell 14262.* Jalisco: Bolaños, *Rose 2885* (G, US). Nuevo Leon: Monterey, Sierra Madre Mts., *C. H. & M. T. Mueller 490.* Guanajuato: Guajito, *Dugès 245 A;* Valley Irapuato, *Pringle 2182.* San Luis Potosi: San Luis Potosi to Tampico, *E. Palmer 1046;* dist. Tanoanhuitz, near Tampamolon, *Seler 228.* Morelos: vicinity of Cuernavaca, *J. G. & Mrs. Lemmon 10.* Vera Cruz: Huasteca, Wartenberg, near Tantoyuca, *Ervendberg 295;* Nogales, *Reddick 124*, alt. 4300 ft. (US); Sanborn, *Orcutt 3071* (US); isthmus of Tehuantepec, Coatzacoalcos, *C. L. Smith 1148;* Mt. Orizaba, Maltrata, *Seaton 379*, 5500 ft.; reg. Orizaba, *Bourgeau 3176;* Rancho Remudadero, *Purpus 14320*, rocky places (F); Zacuapan, *Purpus 8001;* Jalapa, *Pringle 8282*, 4000 ft. (G, US). Oaxaca: Huitzo, *L. C. Smith 214*, 5500 ft.; Valley of Oaxaca, *Nelson 1297*, alt. 5000–5300 ft. (US). Chiapas: between San Richardo and Ocozucuzntla, *Nelson 2968*, 2600–3300 ft. (G, US). Yucatan: *Gaumer 775;* Yucatan, Kancabonot, *G. F. Gaumer & Sons 23518 a* (US). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 1910, 1919, 1925* (F). GUATEMALA: Newton, *Nelson 3556*, 3000–3500 ft. (G, US); Dep.

Santa Rosa, Chupadero, *Heyde & Lux 4159;* near Huehuetenango, *Nelson 3671*, roadside, 6500–8000 ft. (US). HONDURAS: Puerto Cortez, *Carleton 622* (G, US); Dept. Atlántida, near Tela, Lancetilla Valley, *Standley 54018*, 20–600 m. (US). EL SALVADOR: San Salvador, road from San Martin to Laguna de Ilopango, *Standley 22479;* Sonsonate, vicinity of Santa Emilia, *Standley 22124*, about 135 m.; Santa Ana, vicinity of Santa Ana, *Standley 19711*, 655–800 m.; Ahuachapán, vicinity of Ahuachapán, *Standley 20247*, 800–1000 m.; San Salvador, *Calderón 62;* vicinity of San Salvador, *Standley 23592*, 650–850 m. NICARAGUA: Managua, *Chaves 415* (US). COSTA RICA: Cartago, *Cooper 5746;* Prov. Cartago, Cerro de La Carpintera, *Standley 34514*, 1500–1850 m. (US); vicinity of San José, *Standley 47333*, alt. 1130 m. (US). PANAMA: vicinity of Panama, *MacBride 2623* (US); Canal Zone, Balboa, *Standley 27010* (US). BAHAMA ISLANDS: Nassau, *Wight 203*, vacant lot, dry lime, sandy soil. CUBA: Oriente, *Wright 119;* Santiago, vicinity of Baracoa, *Pollard, E. & W. Palmer 241*, 1902; Santiago, vicinity of Santiago City, *Pollard, E. & W. Palmer 276*, 1902; Santa Clara Prov., dist. Cienfuegos, Cieneguita, *Combs 122;* Santa Clara Prov., Cienfuegos, Soledad, near Harvard House, *Senn 114*, potrero. PUERTO RICO: Cabo-Rajo, Miradero, *Sintenis 695*, pastures; without exact locality, *Underwood & Griggs 122;* Vieques Island, vicinity of Isabel Segunda, *Shafer 2462* (NY). JAMAICA: without exact locality, *Grisebach 358;* Moneague, *E. G. Britton 2955* (NY); Mandeville and vicinity, *N. L. Britton 1019*, roadside (NY). HAITI: Mission, Fonds Varetter, *Leonard 3629*, 1000 m. and above. DOMINICAN REPUBLIC: Barahona Prov., near Barahona, *Fuertes 508*, sea level. ST. THOMAS: without exact locality, *Eggers 81;* without exact locality *Eggers s. n.*, Jan. 30, 1876; near Charlotte Amalia, *Rose 3161* (NY). VIRGIN ISLANDS: Tortola Experiment Station, *Fishlock 129*, copses. ST. CROIX: Bassin Yard, *Ricksecker 15* (NY). MARGARITA ISLANDS: El Vallee, *Miller & Johnston 50.* GUADELOUPE: *Duss 2666* (NY). MARTINIQUE: *Duss 1109* (NY). GRENADA: *Broadway s. n.*, Jan. 1905, sandy soil near sea, ballast ground. ST. KITTS: near Sandy Point, *Britton & Cowell 129*, cane field (NY). TRINIDAD: Knagg's Hill Reservoir, *Williams 12062;* road between San Juan and Port of Spain, *Johnston 1;* Carra Valley road, *Britton & Mendelson 1589*, roadside; San Juan to Port of Spain, *Johnston 75*, roadside. ARUBA: *Boldingh 6223* (NY). CURAÇAO: Banks, Patrick, *Britton & Schafer 3062* (NY).

Crotalaria incana is widespread in the American tropics, apparently indigenous there and introduced into the Old World. The species is especially characterized by its very deeply lobed calyx, the tube being almost lacking. There has been considerable confusion concerning the identity of DeCandolle's *C. setifera* (Prod. **2**: 131. 1825), this name being incorrectly applied to many specimens of *C. mollicula*

HBK. *C. setifera* DC. was based upon a tracing of Mociño's drawing of a Mexican plant. This tracing (DeCandolle, Calques Dess. Fl. Mex. Moc. & Sessé, t. 226. 1874) by the deeply cut calyx, the characteristic spreading pubescence of petioles, stem and legume, and by the leaf-shape, clearly shows *C. setifera* DC. to be conspecific with *C. incana* L. *C. herbacea* Schweigg. is not distinct from *C. incana* L., since *C. herbacea* is described as having glabrous leaves except for the lower surface of the mid-vein, but "caule petiolisque pilosissimis" and this variation occasionally occurs within the limits of a single specimen. The amount of pubescence is somewhat variable but the legume is usually covered with long spreading hairs. In one specimen the completely glabrous extreme was found.

21a. C. INCANA L. var. **nicaraguensis** var. nov., a varietate typica differt caulibus petiolis calycibus leguminibusque glabris.—NICARAGUA: Lake Nicaragua, Island Ometépe, *C. L. Smith s. n.*, Jan. 1893, TYPE in the Gray Herbarium.

This variety, striking because of its glabrous legume, stem, petiole and calyx, is known only from the type locality.

22. C. ERIOCARPA Bentham, Bot. Voy. Sulph. 80. 1844. *C. viminalis* Rose in Contr. U. S. Nat. Herb. **8**: 47. pl. 6. 1903.—TYPE LOCALITY: "Tepic," Mexico. DISTRIBUTION: Mexico. MEXICO: Nayarit: Tepic, *Lay & Collie s. n.* (K), TYPE; San Blas, *W. G. Wright 1351;* Acaponeta, Tiger Mine, *Jones 23035* (F). Jalisco: Bolaños, *Rose 2926* (G, US); San Antonia, Lake Chapala, *Herb. Univ. Chicago s. n.*, Feb. 8, 1893 (F); *Diquet s. n.* (NY). Sinaloa: Mazatlan, Villa Union, El Roble, *Ortega 6562; Ortega 7041* (F); Mazatlan, Bellavista, *Ortega 6835*, 10 m. (F); Mazatlan, Ortega 6744, 10 m. (F); vicinity of Mazatlan, *Rose, Standley & Russell 13691* (G, US); Mazatlan and vicinity, *W. G. Wright 1272;* Mazatlan, Isla Piedra, *Lamb 367ª*, sandy soil (G, NY); foothills of Sierra Madre, near Colomas, *Rose 1764;* Mazatlan, *Ortega 5674* (NY). Durango: La Bajada, Tamazula, *Ortega 4394* (US), *Ortega 618* (A). Morelos: near Cuernavaca, *Rose & Hough 4341* (type of *Crotalaria viminalis* Rose, in U. S. National Herbarium); *Rose & Painter 6946; Pringle 6557*, lava beds, 5200 ft. (F, G); *Pringle 11408*, lava fields, 5000 ft.; *Pringle 5993;* Mexico City-Cuernavaca road, *MacDaniels 273*, field, 5500 ft. (F); Tepoztlan, *Fisher 35239*, 7500 ft. (F, NY). Mexico: dist. Temascaltepec, Chorrera, *Hinton 1290*, edge of river, 1230 m., shrub (NY), intermediate between var. *typica* and var. *gloriosa.* Guerrero: Limon Mt., *Rusby 356*, 5000 ft. (NY), intermediate between var. *typica* and var. *gloriosa.* Without exact locality: *Tate s. n.* (K), cited by Bentham; *Allaman s. n.* 1832 (F), photograph and fragment; *Sessé, Mociño, Castillo & Moldonado* 1921 (F).

The very long racemes of large flowers and later the tomentose legumes set this handsome species sharply apart from its congeners. Rose considered that his *C. viminalis* was distinct from *C. eriocarpa* Bentham but a comparison of the types of both species and of the specimens cited above has led to the conclusion that there is no constant set of characters by which they can be separated.

22a. C. ERIOCARPA Bentham var. **gloriosa** (Rose) comb. nov. *C. gloriosa* Rose in Contr. U. S. Nat. Herb. **12**: 273. 1909.—MEXICO: Guerrero: near Iguala, *J. N. Rose, Painter & J. S. Rose 9412* (TYPE of *C. gloriosa* Rose in the U. S. National Herbarium, ISOTYPE in the Herbarium of the New York Botanical Garden); Taxco, *Abbott 249*.

This variety differs in being densely pubescent on both surfaces of the leaves and on the outer sides of the standard, carina and alae of the corolla. The type of *C. gloriosa* has golden-yellow pubescence while that of the other specimen cited is white. The habit of the plant and size of the flower clearly indicate that this entity is conspecific with *C. eriocarpa* Benth. rather than *C. mollicula* HBK. This variety of the Mexican endemic *C. eriocarpa* Benth. has thus far been found only in the state of Guerrero.

23. C. MOLLICULA HBK., Nov. Gen. Sp. **6**: 403. 1824. *C. monticola* Brandegee in Univ. Calif. Publ. Bot. **10**: 406. 1924.—TYPE LOCALITY: "Crescit prope Guanaxuato Mexicanorum, alt. 1070 hex." DISTRIBUTION: Mexico and El Salvador. MEXICO: Chihuahua: Rio Bonita, *LeSueur 710* (F). Morelos: Parque Station, *Pringle 13796*, 7500 ft. (G, US); near Cuernavaca, *Pringle 9180*, mountains, 7500 ft. (G, US); El Parque, *Orcutt 3824* (F); Sierra de Tepoxlan, *Rose & Painter 7226* (US). Zacatecas: near Plateado, *Rose 2765* (NY). Puebla: Cerro de Gavilan, *Purpus 3872* (G, NY, US). Michoacan: Quinceo, vicinity of Morelia, *Arsène 5669*, 2800 m. (G, US); vicinity of Morelia, *Arsène 6653* (US); Cerro Azul, vicinity of Morelia, *Arsène 2696*, 2100 m.; Verarapan, *Pringle 13696* (US). Oaxaca: Jayucattan, *L. C. Smith 105*, 4200 ft.; Rancho de Calderon, *L. C. Smith 106*, 5500 ft.; Sierra de San Felipe, *Pringle 4819*, 6500–7500 ft. (G, US); S. Pedro Nolasco, *Galeotti 3445, 3446*, 7500 ft. (US), approaching var. *Schaffneri;* vicinity of La Parada, *Nelson 1000*, 7500–8500 ft. (G, US); Nopalera a Henitzo, Nochixtlan, *Conzatti 1867* (US); Tecomatlan, *Seler 1541* (US), form with extremely narrow leaflets. Chiapas: Hacienda Monserrate, *Purpus 9133* (isotypes of *Crotalaria monticola* Brandegee at the Field Museum, Gray Herbarium and National Herbarium). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 1911* (F). EL SALVADOR: San Vicente, Volcan de San Vicente, *Standley 21548*, 1200–1500 m. (G, US).

This species is usually a low spreading suffrutescent plant but it

may occasionally be an annual. There is some variation in leaf shape, certain specimens having long, ovate-lanceolate, acuminate leaflets. This variation occurs in the typical variety as well as in var. *Schaffneri*, described below.

23a. C. MOLLICULA HBK. var. **Schaffneri**, var. nov., a varietate typica differt foliis supra glabris vel glabratis.—MEXICO: San Luis Potosi: sandy places about the city, *Schaffner 813* (TYPE in the Gray Herbarium); vicinity of San Luis Potosi City, *Parry & Palmer 128*, 6000–8000 ft., 1878 (G, US): Zacatecas, near Plateado, *Rose 2765* (G), *2783* (US). Tamaulipas: Sierra de San Carlos, vicinity of San José, near crest of range above Mesa de Tierra, *Bartlett 10266* (F); Sierra de San Carlos, vicinity of San José, above La Vegonia, *Bartlett 10051*, 3300 ft. (F). Nuevo Leon: Taray to Rio Santa Ana, Pablillo, southeast of Galeana, Sierra Madre Oriental, *Pennell 17154*, thin soil over shale, 1850–2000 m. (US); Sierra Madre Oriental, Taray to Santa Ana Canyon, about 15 m. s. w. of Galeana, *C. H. & M. T. Mueller 940*, shale in open oak wood (A); Sierra Madre Oriental, Puerto Blanco to Taray, 15 m. s. w. of Galeana, *C. H. & M. T. Mueller 1213*, dry oak wood (A). Nayarit: Tepic, near Santa Teresa, Sierra Madre, *Rose 2179* (NY, US). Jalisco: Chapala, "*S. & E.*" *20*, rocky open hillside, 5000 ft. (US). Puebla: vicinity of Puebla, Cerro de Santa Maria de Zacatepec, *Arsène 3513*, 2500 m. (NY, US). Without exact locality: *Coulter 618* (K); *Coulter s. n.* (G), probably a duplicate of the last specimen cited. GUATEMALA: Dept. Chimaltenango, plains near Tecpam, *Skutch 535*, 2100 m. (A, US), approaching var. *typica*.

Watson (Proc. Am. Acad. **17**: 338, 1882) referred *Schaffner 813* to *Crotalaria eriocarpa* Benth., a species with much larger flowers, larger racemes and a tall fruticose habit. The relations of this entity are clearly with *C. mollicula* HBK.

24. C. MUCRONATA Desvaux in Desv. Journ. Bot. **3**: 76. 1814. *C. striata* DC. Prod. **2**: 131. 1825; Schrank, Syll. Ratisb. **2**: 76. 1828; Hooker, Bot. Mag. **49**: t. 3200. 1832; Grisebach, Fl. Brit. West Ind. 180. 1859; Fawc. & Rend. Fl. Jam. **4**: 12. 1920; Small, Man. Se. Fl. 680. 1933; non *C. striata* Schumacher & Thonning, Beskr. Guin. Pl. **2**: 110. 1827; non *C. striata* A. Braun, Flora **24**: 280. 1841. *C. incana sensu* Ker in Bot. Reg. **5**: t. 377. 1819, non Linn. *C. Brownei* Bert. in DC. Prod. **2**: 130. 1825. *C. pisiformis* Guillemin, Perottet & Richard, Fl. Seneg. Tent. **1**: 162. 1830–33. *C. Hookeri* Arnott in Ann. Sci. Nat. Sér. **2**, 3: 248. 1835. *C. Zuccariniana* D. Dietr. Syn. Pl. **4**: 935. 1847. *C. tinctoria* Boiv. ex Baillon, Bull. Soc. Linn. Paris **1**: 443. 1885.—TYPE LOCALITY: "in Antillis." DISTRIBUTION: Locally introduced in Florida, Alabama, Mississippi, Mexico and the West Indies; occurring also in Brazil, the East Indies, Ceylon, Australia, Hawaii, and tropical Africa. FLORIDA: Alachua Co., 3 miles south of Gainesville, *Wiegand*

& Manning 1494 a, dry sandy open woods; Pensacola, *Curtiss s. n.* (*530 ?*), 1866, ballast ground (G, US); Lee Co., 9 miles south of Fort Myers, *Standley 57562*, weed in cultivated field (F); Lee Co., Bokeelia, *Moldenke 933*, dry sandy soil (NY, US); Lake Co., west Mt. Dora, *Moldenke 8247*, sandy woods (NY); Escambia Co., Escambia Bay, *Bilt. Herb. 9567[a]*, sandy soil (US); Polk City, *O'Neill s. n.*, Aug. 2, 1929 (US); Haines City, *Jesuphf 199* (F); Broward Co., near Lantana, *Small, Britton & De Winkeler 9223*, pinelands (NY); Tampa, *Rolfs s. n.*, May 22, 1919 (NY); Brevard Co., Merritt's Island, *Moldenke 216*, dry sandy soil, roadside (NY); Dade Co., Buena Vista, *Moldenke 431*, dry sandy field (NY, US); Little River, *Dahlberg s. n.*, Nov. 20, 1937. ALABAMA: Baldwin Co., *Ramsey s. n.*, Nov. 1908; Mobile, *Mohr s. n.*, river bank near mouth, Aug. 7, 1893 (US); Mobile, *Mohr s. n.*, ballast ground, Oct. 4, 1888 (US). MISSISSIPPI: McNeill, *Piper s. n.*, Oct. 12, 1921 (NY, US). MEXICO: Michoacan or Guerrero, El Cedral, *Langlassé 305*, 300 m. Vera Cruz: Huasteca, Wartenberg, near Tantoyuca, *Ervendberg 22*. JAMAICA: St. Mary's Parish, Gray's Inn, *Orcutt 4314* (F, G); Portland, Blue Mountains, *Perkins 1258*, roadsides and waste places; without exact locality, *Grisebach s. n.;* Kingston, *Alexander 1850* (*?*) (NY); near Kingston, *Hansen s. n.* (NY); below New Castle, *Britton & Hollick 1771* (NY). PUERTO RICO: Rio Pedras, Finca near Bayamar, *Stevenson 2492* (NY); Puetelo Viejo, *N. L. & E. G. Britton 9101*, roadside (NY). ST. KITTS: *Thompson 557* (NY). WEST INDIES: in America calidiore in Antillis, no collector given (photograph of type of *Crotalaria mucronata* Desv. in the herbarium of the Muséum d'Histoire Naturelle, Paris).

Through the kindness of Prof. H. Humbert of the Muséum National d'Histoire Naturelle in Paris and Mr. J. F. Macbride of the Field Museum in Chicago I have had the opportunity of examining an excellent photograph of the type of this species. This photograph clearly shows the striate carina and elliptic to obovate leaves which are characteristic of the species which has recently passed as *C. striata* DC. Desvaux's description is somewhat inadequate but the photograph of the type leaves no question of the identity of the species. Fawcett and Rendle, l. c., have already suggested that *C. striata* DC. and *C. mucronata* Desv. may be synonymous.

This species has also been confused with *Crotalaria Saltiana* Andrews, Bot. Rep. **10**: t. 648. 1811. According to Baker f., Journ. Linn. Soc. **42**: 309. 1914, *C. Saltiana* Andr. belongs to an entirely different section of the genus, *Farctae* Benth., characterized by long silky hairs lining the inner surface of the legume. Andrews' plate of *C. Saltiana* does not show the legume but the corollas illustrated do not have the brownish markings which are the most distinctive

feature of *C. mucronata* Desv. The Herbarium of the New York Botanical Garden contains a letter from Sir Arthur Hill of the Royal Botanic Gardens at Kew, stating that Dr. John Hutchinson had examined the type of *C. Saltiana* Andr. and found it to be distinct from *C. striata* DC. (*C. mucronata* Desv.). The material from which *C. Saltiana* Andr. was originally described came from Abyssinia and, according to Baker f., loc. cit., the species is limited entirely to Africa. In contrast *C. mucronata* Desv. is a widespread tropical species. Evidently the *Crotalaria striata* Zucc. cited by Dietrich, Syn. Pl. **4**: 935. 1847, is an error for *C. striata* Schrank since the citation in Sylloge Ratisbonensis **2**: 76. 1828 is identical and no *C. striata* Zucc. seems to have been described elsewhere. If so *C. Zuccariniana* D. Dietr. falls in synonymy under *C. mucronata* Desv.

25. C. USARAMOENSIS Baker f. in Journ. Linn. Soc. **42**: 346. 1914.—TYPE LOCALITY: "German East Africa, Usaramo." DISTRIBUTION: Eastern Africa; locally escaped in Florida. FLORIDA: Dade Co., Rockdale, *Moldenke 562*, dry grassy field (NY, US).

This is evidently a very local escape from cultivation since the species has recently been introduced into Florida for use in agriculture (McKee and Enlow, U. S. Dept. Agr. Circ. **137**: 27. 1931). It also occurs as an introduced plant in Java and Sumatra.

26. C. LONGIROSTRATA Hooker and Arnott, Bot. Beech. Voy. **6**: 285. 1838; Bot. Mag. **119**: t. 7306. 1893; Rock, Legum. Plants Hawaii 135. pl. 59. 1920.—TYPE LOCALITY: "Talisco." DISTRIBUTION: Mexico, Guatemala, El Salvador, Nicaragua, Costa Rica and introduced into Hawaii. MEXICO: Chihuahua: Rio Mayo, Guasaremos, *Gentry 2459*, grassy flats (A, F). Nayarit: Tepic, Zopelote, *Lamb 560*, 2000–3000 ft.; Mina Esperanza Rosa Morades, *Ortega 6656* (US). Jalisco: mountains near Lake Chapala, *Pringle 5975* (G,US); Sierra Madre, San Sebastian, Arroyo de Triangulo, *Mexia 1324*, streamside, 1425 m. (A, NY, US). Sinaloa: Culiacan, *Reko 4465*, 50 m. (US). Mexico: Temascaltepec, Cajones, *Hinton 8306* (US). Michoacan: waste fields about Lake Patzcuaro, *Pringle 4144* (F, NY); Patzcuaro Hills, *Pringle 3588;* Coru Station, *Pringle 11957*, 6000 ft. (G, US); vicinity of Morelia, second cascade towards Huerta, *Arsène 5313*, 1950 m. (US). Guerrero: Iguala Canyon, *Pringle 13514*, 2500 ft.; Acapulco and vicinity, *E. Palmer 525*, 1894–1895. Colima: Colima, *E. Palmer 1139*, 1891. Puebla: Cerro de Gavilan, *Purpus 3873*, 7000–8000 ft. Chiapas: near Huehuetan, *Nelson 3823*, 500–2000 ft.; Gutierrez, *Doyle 153* (US). Oaxaca: vicinity of Cafetal Concordia, *Morton & Makrinius 2683*, 400–650 m. (US). Vera Cruz: Papantla, *Seler 3678* (US). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 4908* (F). GUATEMALA: Dept. Escuintla,

Escuintla, *J. D. Smith 2320*, 1100 ped.; Dept. Alta Verapaz, Coban, *von Türckheim II 1349* (G), *II 1949* (F), 1350 m.; Dept. Retalhulen, Retalhulen, *Kellerman 6353*, 237 m. (F); Peten, La Libertad and vicinity, *Mercedes Aguilar H. 32* (F); Chimaltenango, Lugar, Paujachel, *Johnston 788* (F); Santa Maria le Jesus, Sacatepequez, *Popenoe 950* (US); Mazatenango, *Bernoulli 545* (NY). El Salvador: Dept. La Libertad, vicinity of Ateos, *Standley 23416;* Dept. La Libertad, vicinity of Santa Tecla, *Standley 23050*, 790–950 m.; Dept. Sonsonate, vicinity of Izalco, *Standley 21856;* Dept. San Salvador, vicinity of San Salvador, *Standley 19277*, open slope, 650–850 m.; vicinity of San Salvador, *Standley 20585*, roadside, 650–850 m.; San Salvador, *Calderon 5;* Dept. San Vicente, vicinity of San Vicente, *Standley 21294*, in sand along river, 350–500 m. Nicaragua: Dept. Chinandega, Chinandega, *Baker 88*, local along woodland paths. Costa Rica: Cerro de Protti, Escasu, *Solis 308, 316* (F).

27. C. pumila Ortega, Hort. Bot. Matrit. Dec. **2**: 23. 1797; DC. Prod. **2**: 132. 1825; Grisebach, Fl. Brit. West Ind. 179. 1859; Chapman, Fl. S. U. S. ed. 3, 97. 1897; Small, Fl. Se. U. S. 603. 1903; Urban, Symb. Antill. **8**: 279. 1920 (Fl. Domingensis); Fawc. & Rend. Fl. Jam. **4**: 11. 1920; Small, Man. Se. Fl. 680. 1933; non Blanco, Fl. Filip. ed. 2, 397. 1845; non Hochst. et Steudel ex Baker in Oliver, Fl. Trop. Afr. **2**: 17. 1871. *C. litoralis* HBK. Nov. Gen. Sp. **6**: 401. 1824; DC. Prod. **2**: 134. 1825 (as *C. littoralis*). *C. lupulina* HBK. Nov. Gen. Sp. **6**: 402. pl. 590. 1824; DC. Prod. **2**: 133. 1825. *C. triantha* DC. Prod. **2**: 135. 1825; Calques Dess. Fl. Mex. Moc. et Sessé t. 225. 1874; non Steud. ex Baker in Oliver, Fl. Trop. Afr. **2**: 16. 1871. *C. dichotoma* Graham in Edin. New Philos. Journ. **1826**: 186. 1826; Hooker in Bot. Mag. **54**: t. 2714. 1827; Hooker & Arnott, Bot. Beech. Voy. 284. 1838; non Roth, Nov. Pl. Sp. 340. 1821. *C. Grahami* Sweet, Hort. Britt. ed. 2, 128. 1830. *C. Tepicana* Hooker & Arnott, Bot. Beech. Voy. 414. 1840; Walp. Rep. **1**: 594. 1842 (as *C. topicauca*). *C. elliptica* Martens & Galeotti, Bull. Acad. Roy. Bruxelles **10**(2): 34. 1843. *C. Galeotti* Bentham in Hook. Lond. Journ. Bot. **2**: 582. 1843. *C. puberula* Hooker f. in Trans. Linn. Soc. **20**: 225. 1847. *C. pendula* Bentham in Duss, Fl. Phan. Antill. Fr. 193. 1897 (Ann. Inst. Colon. Marseille **3**: 193). *C. chiapensis* Brandegee in Univ. Calif. Publ. Bot. **10**: 406. 1924.—Type Locality: "Insula Cuba." Distribution: Florida, southwestern United States, Mexico, Guatemala, British Honduras, the West Indies and South America. Florida: southern Florida, *Chapman s. n.* (US); Miami, *Tracy 9096;* Indian River, sand ridges between ocean and river, *Curtiss 533* (G, US); Biscayne Bay, *E. Palmer 100*, 1874; Miami, *Garber s. n.*, March, 1877 (G, US); Palm Beach, sand ridges next the ocean, *Curtiss 5361* (F, G); Palm Beach, *Hunnewell s. n.*, 3–7–1912; Dade Co., dry sand, *Fredholm 5654;* Dade Co., Burden's, pine woods, *Eaton 1237;* Miami, *Simpson s. n.*, Feb. 28, 1892; southern Florida, *Cooper s. n.*, 1859; Upper Hatecunbe, *Simpson s. n.*, Feb. 6, 1892 (G, US). Texas: vicinity of El Paso,

Stearns 202 (US); western Texas to El Paso, N. Mex. *Wright 143* (G, US). New Mexico: without exact locality, *Edwards s. n.*, 1849; Chiricahua Mts., *Wright 1018* (G, US); Chiricahua Agency, *Rothrock 534, 684* (US); Dog Mts., Dog Spring, *Mearns 2339* (US); Burro Mts.?, gravelly hills, *Rusby 73* (US). Utah: southern Utah, *Johnson s. n.*, 1875 (US), the correctness of this label has been questioned. Arizona: Fort Huachuca, *Ratzky 89* (US); cañon east side of the San Luis Mts., *Mearns 2188* (US); Tucson, *Griffiths 3363* (US); Fort Crittendon to Patagonia, *Griffiths 6114* (US); Camp Grant, Parade Ground, *Rothrock 727*, 5000 ft. (US); Santa Rita Mts., Gardiner's Spring, *Pringle s. n.*, June 25, 1882 (G, US); base of San Luis Mts., *Mearns 2154*, up to 6000 ft. (G, US); Apache Pass, *Lemmon 543, 544;* Bisbee, *Lloyd s. n.*, Oct. 4, 1890; El Frida, *Jones 192;* Chiricahua Mts., Paradise, *Blumer 1767*, creek sand, 5300 ft. (G, US); Huachuca Mts., Tanner Cañon, *Goodding 823*, open flats in the timber (G, US); near base of Santa Catalina Mts., *Peebles, Harrison & Kearney 2576* (US); Santa Catalina Mts., *Harrison 3012* (US); Bowie, *Jones s. n.*, 1884 (US); Nogales, *Peebles & Harrison 4683* (US); near Fort Huachuca, *Wilcox 444* (US); Empire Ranch, *Griffiths & Thornber 237* (US); Huachuca Mts., *Harrison & Kearney 5780* (US); near Elgin, *Peebles, Harrison & Kearney 3340* (US); Rincon Mts., *Neally 234*, 4500 ft. (US); Mexican boundary line near White Water, *Mearns 2292* (G, US); Chiricahua National Forest, Cochise Co., Portal to Paradise, Silver Creek, *Eggleston 10723* (US). Mexico: Baja California: San José del Cabo, *Brandegee 115* (US). Sonora: 10 miles north of San Rafael Ranch, *Shreve 6384* (F); Rio Mayo, Canyon Sapopa, edge of the milpas, *Gentry 1052* (F, G); Rio Mayo, San Bernardo, *Gentry XO* (F); road between Altar and Magdalena, *Schott III 39* (F); *Thurber 956;* between Santa Ana and Allar, *Piuy, Bigelow, Wright & Schott s. n.*, 1855. Chihuahua: between San Pedro and Fronteras, *Hartman 923;* without exact locality, *E. Palmer 26*, 1869; Santa Cruz, *Thurber 949, 956;* La Cruz de los Cañadas, *Lloyd 386, 387;* Chihuahua, Parral, *Goldman 120;* without exact locality, *Thurber 782;* near Batapilas, Hacienda San Miguel, *E. Palmer 146*, 1885; Rosario east of La Junta, *Pennell 18757*, gravelly soil along stream, 2080–2120 m. (US); *Le-Sueur Mex-478* (F); Rio Mayo, Sierra Canelo, *Gentry 2498*, pine-oak meadow, on eroded gully bank (F); Julimes, banks of Conchos River, *Pilsbry 19326*, 1130–1150 m. (US). Sinaloa: Mazatlan, Zellavista, *Ortega 6837* (F); Ymala, *E. Palmer 1714*, 1891; Rosario, Hacienda Chele, *Lamb 482;* Culiacan, *Brandegee s. n.*, Sept. 13, 1904; Mazatlan, *Ortega 6492.* Nayarit: Santiago, *Lamb 615;* Maria Madre Island, Tres Marias Islands, *Nelson 4248;* Acaponeta, *Rose, Standley & Russell 1426;* Acaponeta, *Jones 23028* (F). San Luis Potosi: vicinity of San Luis Potosi, *Parry & Palmer 127*, 6000–8000 ft., 1878; vicinity of San Luis Potosi, *Schaffner 814*, sandy places about the city. Mexico: Valley of Mexico, Santa Fé, *Bourgeau 576* (?), Oct. 3, 1865–1866; Pedrogal, *MacDaniels 778* (F); dry roadside near Texcoco, *Mac-*

Daniels 571 (F); Fed. Dist., San Angel, *Fisher s. n.*, 7480 ft., July 18, 1924 (F); Fed. Dist., Olivar, *Orcutt 3587* (F); Fed. Dist., Xochimulco, *Orcutt 4343* (F); Fed. Dist., Tlalpam, Pyramid of Cuicuilco, *MacDaniels 50*, 7400 ft. (F); Valley of Mexico, Tlalpam, *Harshberger 217;* Valley of Mexico, Popocatepetl, *Purpus 3230.* Guanajuato: la Presa, de los Pozuelas, *Dugès 245*, hills; Yicama del Cerro, *Dugès 243;* Obregon, *Seler 1141.* Durango: Durango City and vicinity, *E. Palmer 490*, 1896. Morelos: valley near Cuantla, *Pringle 8481*, 4000 ft. Aguascalientes: near city of Aguascalientes, *Rose & Painter 7711.* Zacatecas: San Juan Capistrano, *Rose 2430.* Jalisco: near Guadalajara, Barranca de Ablates, *Barnes & Land 112*, fields, 5000 ft. (F); Guadaljara, *Furness s. n.*, 1909 (F). Michoacan: vicinity of Morelia, *Arsène 9010;* Pedregal d'Uruapam, foot of Tancitaro Mt., *Galeotti 3380*, basaltic rocks, 4000 ft. (type of *C. elliptica* Martens & Galeotti in the herbarium of the State Botanic Garden, Brussels). Guerrero: Taxco, *Abbott 368;* Tlidalgo, Taxmalao, *Seler 4241;* Acapulco and vicinity, *E. Palmer 6*, 1895. Chiapas: Buena Vista, *Purpus 9130* (isotypes of *Crotalaria chiapensis* in the herbaria of the Field Museum, Gray Herbarium, and United States National Herbarium). Oaxaca: near Oaxaca, flood plain of the Rio Atoyac, *Camp 2588* (NY); valley of Cuicatlan, *Nelson 1633*, 1800–2500 ft.; Las Naranjas, *Purpus 3229;* Valley of Etla, *Alvarez 765;* Picacho, San Geronimo, *Purpus 6817; Conzatti & Gonzalez 1025*, 1750 m.; Sola, *Galeotti 3186*, calcareous and basaltic rocks, 5000 ft. (Brussels); savannas on the Pacific coast, *Galeotti 3173* (type of *Crotalaria Galeotti* Benth. in the Herbarium of the Royal Botanic Gardens, Kew). Vera Cruz: Tlacomitla, *Purpus 1321*, oak forest (F); Carrizal, *Barnes, Chamberlain & Land 19*, roadsides (F); Zacuapan, Barranca de Tenampa, *Purpus 2915;* Totutla, *Galeotti 3295*, temperate forest, 4000 ft. (type of *Crotalaria elliptica* var. *multiflora* Martens & Galeotti in the Herbarium of the State Botanic Garden, Brussels); Isthmus of Tehauntepec, Coatzacoalcos, *C. L. Smith 997.* Yucatan: flats about Nohpat, also Najcaeab, *Schott 715* (F); Villahermosa, Campeche, *Lundell 1164* (F); Buena Vista, *Gaumer s. n.*, 1899 (F); Real de Monte, *Coulter s. n.* (Kew). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 1920, 1923, 1924, 1930, 1931, 2013* (F). GUATEMALA: Santa Rosa, Rio de Las Cañas, *Heyde & Lux 3735*, 3000 pp.; Chimaltenango, Alameda, *Johnston 915* (F); Peten, La Libertad and vicinity, *Aguilar H. 184* (F). BRITISH HONDURAS: Corozal Dist., *Gentle 258, 634* (F); Corozal Dist., San Andres, *Gentle 1085* (NY). BAHAMA ISLANDS: New Providence, Nassau, *J. I. & A. R. Northrop 67;* New Providence, *Cooper s. n.*, 1881; 3 miles south of Nassau-Blue Hills road, *Wight 74*, among pines; New Providence, Fort Fincastle, *Millspaugh 2501*, old quarry; Nassau, near Fort Montague, along Bay St. to Fox Hill, *Wight 12*, in sand and grass. CUBA: near Matanzas, *Rugel 48*, 1849; Santa Clara, dist. Cienfuegos, Cieneguita, *Combs 219*, poor soil, waste places; Santa Clara, Soledad, near Harvard House, *Senn 391*, potrero; San Cristobal,

San Burtotome, *Wright 2296*, savannas; without exact locality, *Boldo s. n.* (F). JAMAICA: Queen Ann's Bay, *Churchill s. n.*, roadside, Mar. 19, 1897; St. Ann's Bay, south of Gully road, *Harris 10368*, dry hillside (NY). COZUMEL ISLAND: east shore, *Millspaugh 1578* (F, NY); center of the island, *Millspaugh 1566* (F). DOMINICAN REPUBLIC: Barohana, *Fuertes 656*, 350 m. (G, NY). ST. KITTS: *Britton & Cowell 140*, roadside (NY). ANTIGUA: east of St. John, *Rose, Fitch & Russell 3408* (NY). MARTINIQUE: *Duss 818* (NY, US); *Duss 4081* (NY). BARBADOS: Locust Hill, St. George, *Dash 423*, roadside (NY).

This is very widespread and variable, weedy species. The leaf-shape varies from cuneate-obovate to elliptic or oblong. A variety *obcordata* was proposed by Grisebach but the variation on a single plant may be so extreme that it has been considered best to make no varietal segregation. There is also variation in habit from the procumbent plant of the seashore to the more erect one of higher altitudes. There are distinct herbaceous annuals and suffruticose types which are probably perennial. Specimens from dry habitats tend in general to have smaller leaves and fewer flowers per peduncle than do those from moist habitats. In certain forms the standard of the flower tends to be reddish in colour.

28. C. FILIFOLIA Rose in Contr. U. S. Nat. Herb. **5**: 136. pl. 14. 1897. *C. tenuissima* Rose in Contr. U. S. Nat. Herb. **8**: 46. 1903. *C. gracilenta* Rose in Contr. U. S. Nat. Herb. **8**: 313. 1905.—TYPE LOCALITY: "Lava beds near Cuernavaca" (Morelos, Mexico). DISTRIBUTION: Mexico. MEXICO: Sinaloa: San Ignacio, Cerro de Aguajito Campanillas, *Montes & Salazar 578* (US). Nayarit: between Pedro Paulo and San Blascito, *Rose 1981* (type of *C. tenuissima* Rose at the National Herbarium, isotype at the Gray Herbarium). Jalisco: near Etzatlan, *Rose & Painter 7570* (type of *C. gracilenta* Rose at the National Herbarium, isotype at the Gray Herbarium); dry slopes of the mountains above Etzatlan, *Pringle 8857*, 6000 ft. (G, US); Etzatlan, *Pringle 11893* (US); Nuevo Leon: Sierra Madre Oriental, Taray to Santa Ana Canyon, about 15 m. s. w. of Galeana, *C. H. & M. T. Mueller 941*, sparse on shale soil in open oak woods (A). Mexico: dist. Temascaltepec, Nanchititla, *Hinton 4717*, llano (US); Bejucos, *Hinton 8176*, llano (US); *Hinton 1474*, on prairie, 610 m. (US); Tenayac, *Hinton 4835*, llano, 1540 m. (F, US). Morelos: lava beds near Cuernavaca, *Pringle 6553*, 5200 ft. (TYPE at the U. S. National Herbarium, ISOTYPES at the Gray Herbarium and Arnold Arboretum). Guerrero: Los Amates Station, *Pringle 10064*, hills, 2500 ft. (G, US); Coyuca, Balderiama, *Hinton 6498*, hill (F, US). Oaxaca: Cerro Nueve Puntas, Mazatlán, *Conzatti 1506*, 2400 m. (US). Without exact locality, *Sessé, Mociño, Castillo & Moldonado 1908* (F).

There seems to be no adequate justification for maintaining the

three species proposed by Rose as distinct. There are certain variations in leaf-shape and -size, the leaves of *Rose 1981* (*C. tenuissima* Rose) being much longer than those of *Pringle 6553* (TYPE of *C. filifolia* Rose), which has very narrow almost setaceous leaves. There are evidently some variations in habit, some collections being obviously annual plants while others tend to be suffruticose and may be perennial. The flowers and fruits of *Pringle 6553* are somewhat smaller than those of the other sheets examined but not significantly so. Until much more abundant material is available it seems advisable to consider this complex one variable species.

28. C. VITELLINA Ker in Bot. Reg. **6**: t. 447. 1820. *C. cajanifolia* HBK. Nov. Gen. Sp. Pl. **6**: 405. 1824. *C. brasila* Schrank, Syll. Ratisb. **2**: 77. 1828. *C. lotifolia* Poepp. ex Steudel, Bot. Nomencl. ed. 2, **1**: 443. 1840, non Linn. *C. Poeppigii* Presl, Bot. Bemerk. 123. 1844. *C. guatemalensis* Bentham in Kjöben. Vidensk. Meddel. **1-2**: 2. 1853 (Legum. Centroam. 2). *C. Carmioli* Polakowsky, Linnaea **41**: 558. 1877.—TYPE LOCALITY: described from a plant grown at the nursery of Messrs. Colville, in Kings' Road, Chelsea, the plant introduced from "the Brazils." DISTRIBUTION: Mexico, British Honduras, Guatemala, El Salvador, Costa Rica, Panama and locally in Cuba.

KEY TO THE VARIETIES

Leaves glabrous above, pilose beneath.
Leaflets ovate-elliptic to elliptic-lanceolate.....Var. *typica.*
Leaflets obovate or obovate-elliptic.....Var. *Orcuttiana.*
Leaves velutinous to pilose above, pilose beneath.....Var. *Schippii.*

Var. TYPICA.—MEXICO: Sinaloa: vicinity of Culiacan, Cofradia, *Brandegee s. n.*, Oct. 31, 1904. Nayarit: Acaponeta, Tiger Mine, *Jones 23035* (NY); vicinity of San Blas, old Spanish road at Singaiba, *Ferris 5542* (A). Jalisco: Sierra Madre Mts., Arroyo de Triangulo, San Sebastian, *Mexia 1326*, streamside, 1425 m. (F); Juanacatlan, *Pringle 9738*, rocky soil, 5000 ft. Tamaulipas: Sierra de San Carlos, vicinity of San José, near crest of range above Mesa de Tierra, *Bartlett 10266* (US); Manzanillo, *E. Palmer 979*, 1890. Tabasco: Tierra Colorada, *Rovirosa 33* (US). Michoacan: vicinity of La Orilla, *Langlassé 159*, 25 m. Michoacan or Guerrero: El Cedral, *Langlassé 305*, 300 m. Guerrero: Acapulco and vicinity, *E. Palmer 217*, 1894–1895; along Cuernavaca-Taxco road, 10 miles from Taxco, *MacDaniels 102*, moist pasture, 5500 ft. (F); Iguala, *Pringle 8437*. Huasteca, Wartenberg near Tantoyuca, *Ervendberg 22*, old fields, 1858. Puebla: Huauchinango, Tepexic, *Fröderstrom & Hultén 1040* (NY); Huauchinango, convalles torrentis Necaxae, *Fröderstrom & Hultén 853*, 1100 m. (F). Chiapas: Jalisco, *Purpus 8891* (F); Jalisco, *Purpus 9132* (F, NY), the sheet in the Herbarium of the New York Botanical Garden bearing one specimen with very long pedicels, evidently due to a disease or

some other type of abnormality. Oaxaca: Rio Cascabel, *Mell 2295* (NY); Salina Cruz, *Deam s. n.*, Dec. 20, 1898, sand. Vera Cruz: Zacuapan, *Purpus 7846;* Sanborn, *Orcutt 3448* (F). Yucatan, Kancabonot, *Gaumer & Sons 23518* (F); Lake Chichancanab, *Gaumer & Sons 23641* (F). Without exact locality: *Sessé, Mociño, Costillo & Moldonado 1918, 1927* (F). GUATEMALA: Costa Grande, Txtacapa, *Bernoulli 535* (photograph in the Gray Herbarium and photograph and fragment in the Herbarium of the Field Museum of Natural History, type of *Crotalaria guatemalensis* Benth.); Gualan, sandbar along the Gualan river, *Deam 6326*, 620 ft. (F, G); Gualan, *Deam 287, 288*, 420 ft.; Jalapa, Volcano Imay, *Kellerman 7806*, 5000 ft. (F); Dept. Quezaltenango, El Palmar, *Kellerman 6343*, 2300 ft. (F); Dept. Amatitlán Laguna, *Morales Ruano 1261*, 1110 m. (F); Dept. Sololá, Santa Bárbara, *Shannon 571*, 1370 pp. (US); Dept. Retalhulen, Rio Samalá, *Shannon 569* (US); Amatitlan, Laguna, Lake Amatitlan, *Kellerman 5397*, 1200 m. (F); Chimaltenango, Cuilapa, *Johnston 1081* (F); Dept. Esquintla, Finca El Zapote, *Muenscher 12416*, volcanic flow (F); Chimaltenango, Palin-Santa Maria, *Johnston 923* (F); Dept. Escuintla, Escuintla, *J. D. Smith 2321*, 1100 pp.; Amatitlan, Palin, *J. D. Smith 2807*, 3560 ped.; Santa Rosa, Cerro Gordo, *Heyde & Lux 3284*, 3500 ped.; Santa Rosa, Volcan Jumaytepeque, *Heyde & Lux 3716*, 6000 ped. EL SALVADOR: Dept. Ahuachapán, Ahuachapán, *Standley 20250*, sandbar along stream, 800–1000 m.; Dept. La Libertad, vicinity of La Libertad, *Standley 23243*, gravel along river, sea level; Dept. Sonsonate, vicinity of Izalco, *Standley 21863*, thicket; San Vicente, vicinity of San Vicente, *Standley 21188*, sand along river, 350–500 m.; Sonsonate, vicinity of Sonsonate, *Standley 21777*, sand along stream, 220–300 m.; Sonsonate, vicinity of Acajutla, *Standley 21948*, sandy thicket, 30 m. or less; San Salvador, road from San Martín to Laguna de Ilopango, *Standley 22585*, sand; San Salvador, vicinity of San Marcos, *Standley 22791*, moist open bank. COSTA RICA: vicinity of San José, *Standley 34792*, in pasture, 1150 m. (US); Prov. San José, vicinity of San Sebastian, *Standley 32680*, 1150 m. (US); San Pedro de San Ramón, *Brenes 4936*, hills, pastures (F); San José, *Tonduz 776* (F, G, US); Alto de La Cabra de San Ramón, *Brenes 5893* (F); La Palma de San Ramón, *Brenes 11335*, 1100 m. (F); Cerro de Protti, Escasu, *Solis 315* (F); Cartago, *Torres 168* (F); vicinity of San José, *Standley 41205*, wet thicket, 1130 m. (F); San José, *Pittier 776* (F); San José, vicinity of El General, *Skutch 2956*, 880 m. (G, NY); without exact locality, *Polakowsky 306* (photograph in the Gray Herbarium and photograph and fragment in the herbarium of the Field Museum of Natural History, type of *Crotalaria Carmioli* Polakowsky). PANAMA: Prov. Panama, near Panama along Corozal road, *Standley 26864*, moist thicket; Canal Zone, Barro Colorado Island, *Aviles 13* (F); Canal Zone, around Culebra, *Pittier 4783*, 50–150 m. (NY); Cerro Ancón, *Heriberto 135* (NY); without exact locality, *Hayes 17, 39* (NY); Canal Zone, Balboa, Sosa Hill, *Standley 26415*,

brushy slope (A). CUBA: Havana, vicinity of San Pedro, *Leon 7192* (NY); Havana, Cayo La Rosa, *Leon & Edmund 8710* (NY); Santa Clara, Sancti-Spiritus Mts., La Sierra, *Leon & Clement 6443* (NY); without exact locality, *Wright 2295*.

29a. C. VITELLINA Ker var. **Orcuttiana**, var. nov., a varietate typica differt foliis obovatis vel obovato-ellipticis, apice obtuso vel subretuso.—MEXICO: Colima, *Orcutt 4605* (TYPE in the herbarium of the Field Museum of Natural History).

29b. C. VITELLINA Ker var. **Schippii**, var. nov., a varietate typica differt foliis supra velutinis vel pilosis.—MEXICO: Temascaltepec, La Labor, *Hinton 1870*, 2000 m. (US). BRITISH HONDURAS: Stann Creek, *Schipp 493*, along sea beach (TYPE in the Gray Herbarium, ISOTYPES in the herbaria of the Field Museum of Natural History, the New York Botanical Garden and the Arnold Arboretum).

Crotalaria vitellina Ker is an upright tall herb especially characterized by the inflorescence being opposite the leaves and by the brownish markings at the apex of the carina.

Riley (Kew Bull. **1923**: 333, 1923) included a specimen cited as Cofradia, *Brandegee*, under *Crotalaria eriocarpa* Benth. The specimen examined at the Gray Herbarium, Sinaloa, vicinity of Culiacan Cofradia, *Brandegee s. n.*, Oct. 31, 1904, differs from the type of *C. eriocarpa* Benth. by the legume being appressed-pubescent rather than "dense tomentoso-villoso," and by the almost glabrous rather than pubescent standard of the flower.

30. C. MAYPURENSIS HBK. Nov. Gen. Sp. Pl. **6**: 403. 1824; Urban, Symb. Antill. **9**: 447. 1928. *C. leptophylla* Bentham in Ann. Nat. Hist. **3**: 430. 1832. *C. Acapulcensis* Hooker & Arnott, Bot. Beech. Voy. Suppl. 414. 1840. *C. anagyroides* Kth. var. *pauciflora* Grisebach, Cat. Pl. Cub. 69. 1866.—TYPE LOCALITY: "Crescit in ripa Orinoci, prope Maypures." DISTRIBUTION: Mexico, Guatemala, British Honduras, Honduras, Costa Rica and western Cuba. MEXICO: Mexico: dist. Temascaltepec, Tenayac, *Hinton 4854*, llano, 1650 m. (US); Nauchititla, *Hinton 6757*, hill (F); Rincón de Carmen, *Hinton 1626*, 1340 m. (US). Vera Cruz: Huasteca, near Tantoyuca, Wartenberg, *Errendberg 26*. Guerrero: vicinity of Acapulco, *E. Palmer 319*, 1894–1895. Michoacan or Guerrero: El Calabazal, *Langlassé 475*, sol sableux. Oaxaca: Cañada de San Gabriel, *Conzatti & Gonzalez 381*, 2000 m.; Valley of Oaxaca, *Nelson 1433*, 5500–7500 ft.; Dist. del Centro, Cerro San Felipe, *Conzatti 2307*, 1800 m. (F, G); Totontepec, *Nelson 817* (F); 15–18 km. w. s. w. of Oaxaca, near San Pablo Quatro Venados, cañon of the Rio Zavaleta, *Camp 2533* (NY); Sierra de San Felipe, *Pringle 4818*, 6–7000 ft.; Cuilopan, *L. C. Smith 42*, 5500 ft. Chiapas: Jalisco, *Purpus 8891*. Vera Cruz: Zacuapan, Fortin, *Purpus 8010*; Zacuapan, *Purpus 10910* (F, US); near Zacuapan, *Rozynski*

627 (F); Chavarillo, *Barnes, Chamberlain & Land 21*, hillsides (F); Mirador, *Liebmann 4863* (F); Cousoquitla, *Liebmann 4862* (F). GUATEMALA: Santa Rosa, Volcan Jumaytepeque, *Heyde & Lux 3717* 6000 pp.; Santa Rosa, Buena Vista, *Heyde & Lux 4137*, 5500 ft., (G, US); near Guatemala, sides of Sapoti baranca, *Hayes s. n.*, July, 1860; Dept. Escuintla, Texcuaco, *Morales R. 1075*, 100 m. (F); Jalapa, El Rancho, *Kellerman 7672*, 1000 ft. (F); Dept. Jalapa, Jalapa, *Kellerman 7899*, 4450 ft. (F); Dept. Huehuetenango, above San Sebastian, *Skutch 1199*, bushy mountain side, 6900 ft. (A). BRITISH HONDURAS: without exact locality, *Peck 590*, pine ridges. HONDURAS: Santa Barbara, San Pedro Sula, *Thieme 5187*, 600 pp. (G, US); Cortes, Rio Lindo, *Edwards P-682*, dense tropical forest, 2000 ft. (F). COSTA RICA: Escasu, *Solis 97* (F). PANAMA: Prov. Panama, near Panama, vicinity of Juan Franco race track, *Standley 27740* (US). CUBA: Pinar del Rio, Guane to Mendoza, *Shafer 10574* (F, NY); Pinar del Rio, Laguna Santa Maria, *N. L. & E. G. Britton & Gager 7158*, white sand (NY); Pinar del Rio, Laguna Jovero and vicinity, *Shafer 10762* (NY); 12 km. south of Pinar del Rio City, savanna east of Coloma road, *Leon & Roig 12886* (NY); San Julia, *Wright 2294*, pine grove.

This species is closely related to the following but is distinguished from it by a more slender habit, finer pubescence, and much narrower and smaller leaflets.

31. C. ANAGYROIDES HBK. Nov. Gen. Sp. Pl. **6**: 404. 1824; DC. Prod. **2**: 130. 1825; Grisebach, Fl. Brit. West Ind. 180. 1859; Rock, Legum. Plants Hawaii 135. pl. 136. 1920; Urban, Symb. Antill. **9**: 448. 1928. *C. incana* var. β. Lamarck, Encyc. **2**: 200. 1786. *C. Dombeyana* DC. Prod. **2**: 132. 1825. *C. stipulata* Vellozo, Fl. Flum. 307. 1825; Fl. Flum. Ic. 7. t. 109. 1827.—TYPE LOCALITY: "Crescit prope Caracas, alt. 460 hex." DISTRIBUTION: South America and very locally in Mexico, Honduras and the West Indies. MEXICO: Jalisco: Hacienda of San Marcos, *Pringle 5495*. Colima: foothills of Volcano Colima, *Goldsmith 83*, 7000 ft.; Gro Rio Balsas, *Orcutt 4430* (F). Without exact locality: *Sessé, Mociño, Castillo & Moldonado 3752* (F). HONDURAS: Dept. Atlantida, near Tela, Lancetilla Valley, *Standley 53449*, 20–600 m. (US). ST. VINCENT: *H. H. & G. W. Smith 1034*, open places not far from sea level. TRINIDAD: Lady Chancellor Road, *Britton & Broadway 464*, roadside; St. Ann's, *Broadway s. n.*, Dec. 1, 1919.

This South American species, which has been reported from only a few stations in the region under discussion, may usually be distinguished by its rather coarse, definitely striated, upper branches and axis of the inflorescence.

Doubtful or Excluded Species

Crotalaria alba L. Sp. Pl. 716. 1753. = *Baptisia alba* (L.) R. Br.
C. altissima Sessé & Mociño, Fl. Mex. ed. 2, 166. 1894.

The description of this species is not sufficiently adequate to permit placing it accurately. Perhaps its closest affinities are with *C. vitellina* Ker.

C. bialata Schrank, Pl. Rar. Hort. Monac. t. 13. 1819.

Crotalaria bialata probably belongs in the *C. sagittalis* group, near *C. sagittalis* L. or *C. stipularia* Desv. The illustration shows more or less elliptic leaves throughout the length of the stem as in the latter species but the stipules shown are acute and not falcate as in *C. stipularia* Desv.

C. flexuosa Eaton, Man. Bot. N. Am. ed. 6, 113. 1833; Raf. New Fl. N. Am. **2**: 56. 1836; non Moench, Meth. Suppl. 55. 1802.

This was described from a Carolina specimen as having dentate leaves and spines. It is clearly not a *Crotalaria*.

C. havanensis Gussone in Linnaea, Litt.-Bericht. **4**: 36. 1829.

The description of this species is entirely too inadequate to permit associating it with any of the recognized species or giving it specific status until the type is examined.

C. hexaptera Schrank, Syll. Ratisb. **2**: 79. 1828.

This species has been associated with *C. pilosa* Mill. (*C. pterocaula* Desv.) but the stems of this plant have two fairly broad wings and two ridges rather than six wings as described for *C. hexaptera* Schrank. The type was from a specimen originating in Brazil and cultivated in a greenhouse.

C. pendula Bertero in DC. Prod. **2**: 130. 1825 = *C. laburnifolia* L. Sp. Pl. 715. 1753.

Through the courtesy of the Field Museum a photograph of the type of this species was obtained. The type specimen was grown in a garden in Jamaica. The large flowers with the carina much longer than the alae and the long-stipitate pod indicate that this species is conspecific with the Old World *C. laburnifolia* L. No North American material which could be referred to this species was found in any of the herbaria examined.

C. perfoliata L. Sp. Pl. 714. 1753. = *Baptisia perfoliata* (L.) R. Br.
C. undulata Knowles & Westcott, Fl. Cab. **2**: 158. 1838.

This species probably is synonymous with *C. sagittalis* L. or one of

the closely related species but the description is too inadequate to place it accurately in this difficult and variable group. The type was a specimen grown in England in 1837 by G. Barker Esq. from seed sent from Mexico.

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NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XVII. ELATINE AND OTHER AQUATICS

Norman C. Fassett

This study of *Elatine* as it occurs in North America is largely the result of support by the Wisconsin Alumni Research Foundation. The writer is indebted to the curators of the herbaria of the Missouri Botanical Garden, the Field Museum, the University of Minnesota, Iowa State College, and of the Gray Herbarium, for loans of material, and to Miss Nell C. Horner, Librarian at the Missouri Botanical Garden, for assistance in locating much of the literature. The drawings of seeds are by my student, Miss Elizabeth A. Chavannes.

Individuals of any species of *Elatine* grown under different conditions, as when some are submerged and others stranded on the mud, resemble each other less closely than do individuals of different species grown under similar conditions. No more reliable than habit are other vegetative characters, such as size and shape of stipules. The shape of leaves seems in some cases correlated with geographic range. In the seeds is found the most satisfactory basis for classification. There are three perfectly distinct seed types in North America, but groups within one of these types, here all "lumped" under *E. triandra*, show great variation in the size of seeds and the number of pits on the seed-coat. These will be discussed under that species.

For handling these minute seeds, none of them more than 750 μ long, it was found most practical to mount them on strips of film about 1 x 2 cm., after which they could be easily handled under a compound microscope. Acetate film was used; discarded safety-base film, with the emulsion removed by boiling, is the most easily available source. In cases where ample material lies in a packet, loose seeds can often

be located with a binocular microscope; a piece of film is smeared with an acetone solution of film, and the seeds taken up as by blotting. In other cases a capsule is carefully opened with needles and a few seeds laid on the film. A drop of acetone is then run over it, and enough of the film is dissolved to make the seeds adhere without obscuring their surfaces in the least.

The genus *Elatine*, as it occurs in North America, may be classified as follows:

a. Capsule with 2–3 carpels, sessile; seeds straight or slightly curved, nearly uniformly rounded at each end....*b.*
b. Seed-coat with pits rounded at the ends, their ends not extending between the ends of pits in adjacent rows; pits scarcely reduced in size toward the ends of the seed; carpels usually 2.....*E. minima.*
b. Seed-coat with pits 6-sided, angled at the ends, their ends extending between the ends of pits in adjacent rows; pits somewhat narrower and less distinct toward the ends of the seed; carpels 3.....*E. triandra.*
c. Seeds 400–700 μ long, 140–250 μ thick, with pits in rows of 16–25 each....*d.*
d. Leaves linear to spatulate, often emarginate at tip. *E. triandra* var. *genuina.*
e. Aquatic forms with branches erect from creeping stems; internodes (1.5) 3.5–14 mm. long and 0.5–1.5 mm. thick; leaves 2.8–13 mm. long and (0.5) 0.8–2 mm. wide, bright green, translucent....*f.*
f. Internodes (1.5) 3.5–14 mm. long; leaves 3–13 mm. long.....*E. triandra* f. *submersa.*
f. Internodes (1.5) 3–8.5 mm. long; leaves 2.8–6.5 mm. long.....*E. triandra* f. *intermedia.*
e. Terrestrial forms with much branched creeping stems and prostrate leaves; internodes 0.5–5 mm. long and 0.3–0.8 mm. thick; leaves 2–5 (6) mm. long and 0.5–1 (1.8) mm. wide, dark green, often reddish and shining, opaque.....*E. triandra* f. *terrestris.*
d. Leaves obovate, only rarely emarginate..*E. triandra* var. *americana.*
c. Seeds 350–600 μ long, 160–280 μ thick, with pits in rows of 9–15 each....*g.*
g. Leaves linear to narrowly oblong....*E. triandra* var. *brachysperma.*
g. Leaves obovate.....*E. triandra* var. *obovata.*
a. Capsule with 4 carpels, peduncled; seeds U-shaped or J-shaped, rounded at one end and truncate and subapiculate at the other....*h.*
h. Leaves obtuse or rounded at tip.....*E. californica.*
h. Leaves slightly emarginate at tip.....*E. californica* var. *Williamsii.*

E. MINIMA (Nutt.) Fisch. & Meyer, Linnaea x. 73 (1836); Fernald, Rhodora xix. 13 (1917). For full synonomy see Fernald, l. c.—Map 1; Fig. 1.—The following may be added to the collections cited by Fernald. Prince Edward Island: shallow water, sandy margin of Lake Verde, August 9, 1912, *Fernald, Long & St. John*, no. 7765 (Gray; N. Y.). Nova Scotia: sandy and muddy tidal flats of Tusket

River, Tusket Falls, August 20, 1920, *Fernald, Bissell, Graves, Long & Linder*, no. 21884 (Gray; Mo.; Field); shallow water at sandy margin of Harper's Lake, Shelburne County, August 5, 1921, *Fernald & Long*, no. 24164 (Gray; N. Y.). MASSACHUSETTS: on mud, Maxcy's Pond, Nantucket Island, September 12, 1907, *E. P. Bicknell* (N. Y.). NEW YORK: in sand, submerged in 1 m. of water, West Caroga Lake, Fulton County, August 19, 1934, *Muenscher & Clausen*, no. 4521 (Mo.). MICHIGAN: Sister Lakes, Van Buren County, *Arthur W. DeSelm*, no. 23 (Field). ONTARIO: Pothole Portage, Sudbury District, August 20, 1932, *Fassett*, no. 14607 (Mo.; Wis.); Port Sandfield, Lake Muskoka, September 1, 1889, *Dr. & Mrs. N. L. Britton & Miss Millie Timmerman* (N. Y.). WISCONSIN (selected from 26 collections in the Herbarium of the University of Wisconsin): Cable Lake, Spooner, September 12, 1929, *Fassett & McLaughlin*, no. 12673; Drummond, September 11, 1934, *Steenis & Sanford;* in 1 m. water, Bass Lake, Hayward, August 17, 1929, *E. M. Gilbert & N. C. Fassett*, no. 12669; sandy shore, Hanscom Lake, Web Lake, September 21, 1928, *Fassett*, no. 12675; Little John Jr. Lake, Trout Lake P. O., August 3, 1932, *L. R. Wilson*, no. 3030; Lake St. Croix, Solon Springs, July 27, 1931, *J. H. Steenis*, no. 578; sandy shore, Crystal Lake, Comstock, August 29, 1929, *W. T. McLaughlin;* in 2 dm. water, sand bottom, Malby Lake, Minocqua, September 13, 1927, *Fassett*, no. 5371. MINNESOTA: growing on sandy lake shore and in shallow water, Pfrinner's Lake, north of Woman Lake, Cass County, September 3, 1929, *C. O. Rosendahl*, no. 6099 (Minn.).

In the middle west this is always in sand, in contrast to *E. triandra* which favors mud. In the east it also occurs on muddy tidal shores. It is more uniform in habit than is *E. triandra*, although Bicknell[1] described some variation with habitat.

E. TRIANDRA Schkuhr, Bot. Handb. i. 345, t. 109b, fig. 2 (1791). MAP 2, FIG. 2.

E. triandra var. **genuina** (*E. triandra* Schkuhr) of Europe appears inseparable from the North American plant. Its American range (Map 2) is scattered from southern Canada to Mexico, and from the Pacific coast states to Wisconsin and Texas. It is mostly at high elevations, and seems to occupy lakes and intermittent pools. In Wisconsin its occurrence is probably related to the Driftless Area.[2] Its scattered range in the western states suggests an ancient distribution, perhaps correlated with a past era of greater humidity than at present. That the isolations are of great antiquity is indicated by the behavior of the seeds, which from locality to locality vary in size,

[1] As *E. americana*, in Bull. Torr. Bot. Club xl. 612–613 (1913).
[2] See Fassett, Trans. Wis. Acad. xxv. 199–200 (1930).

proportions, and number of pits, but are remarkably constant at each locality.

In North America, as in Europe, *E. triandra* occurs in 3 more or less arbitrarily distinguished forms. Forma *submersa* Seubert is long-stemmed and limp, and is described by Glück[1] as growing in from 10–40 cm. of water. This is the only form occurring, almost certainly as an introduction, in Skowhegan, Maine, as reported by Fernald, l. c. Individuals closely resembling the Skowhegan plant, but without doubt native, have been collected by the writer in Wisconsin, where they were accompanied by the other two forms. The occurrence of but one form at Skowhegan is due simply to the fact that the pond has been enlarged and the grassy banks round off sharply into the water, so there is no opportunity for any but f. *submersa* to grow.

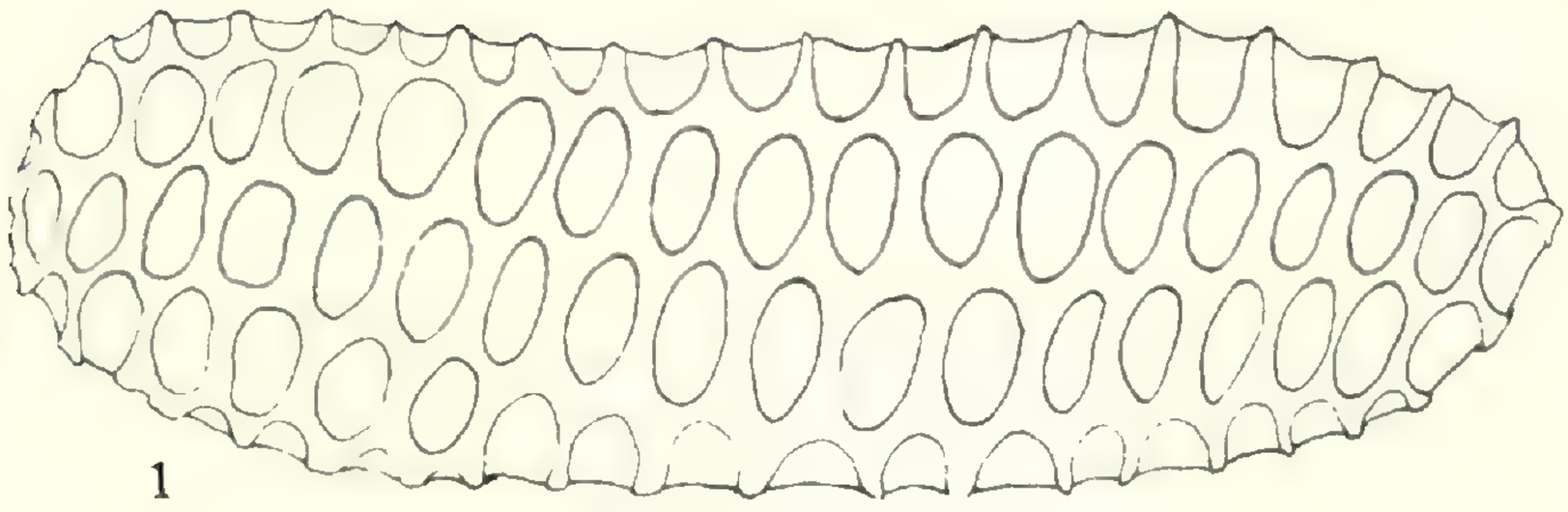
Forma *terrestris* occurs on the mud, and is the most common form in western North America, where it apparently grows in pools that dry up as the season progresses. The flowers usually open and are more conspicuous than in the submerged forms. The plants often take on a red coloring; such red individuals have been described as *E. rubella* Rydb.[2]

Forma *intermedia* Seubert has flowers which, according to Glück, sometimes open and sometimes remain closed. It is a shallow water form.

The following collections of *E. triandra* var. *genuina*, including the three forms, have been examined. Maine: bottom of little pond, Park, Skowhegan, October 28, 1916, *L. H. Coburn* (Gray); small pond in Coburn Park, Skowhegan, August 20, 1931, *Fassett*, no. 13564 (Gray; Field; Wis.). This locality is not indicated on Map 2, the plant there being almost certainly an introduction. Wisconsin: Kettleson Pond, 5 miles east of Wisconsin Dells, July 24, 1932, *Fassett & Hotchkiss*, no. 14533 (Wis.); in 1 dm. water, kettlehole in the Johnstown Moraine, 10 miles northeast of Kilbourn (now Wisconsin Dells), Big Spring, September 22, 1929, *Fassett, Uhler & McLaughlin*, no. 9136 (Wis.) & 9137 (Gray; Field); shallow water, soft mud bottom, Round Lake, St. Croix Falls, September 5, 1927, *Fassett & Wilson*, no. 15290 (Wis.; Gray). North Dakota: on bottom of muddy pool, a mile north of the college campus, Minot, June 30, 1930, *Olga Lakela*, no. 468 (Minn.); mud, low place in field, Wild Rice, August 27, 1919, *O. A. Stevens*, no. 726 (Minn.); in dried mud of pond, Glen Ullin, July 25, 1912, *H. F. Bergman*, no. 2447 (Minn.). South Dakota: Belvidere, August, 1928, *John W. Moore*, no. 841 (Minn.).

[1] Die Süsswasser-Flora Mitteleuropas xv. 299–300 (1936).

[2] Mem. N. Y. Bot. Gard. i. 260 (1900).



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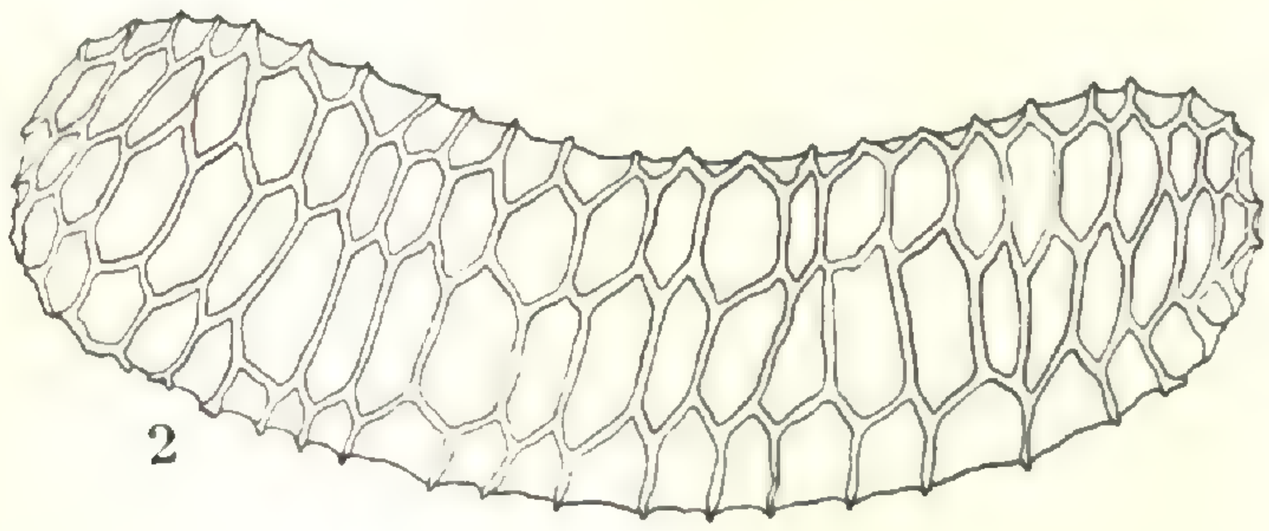

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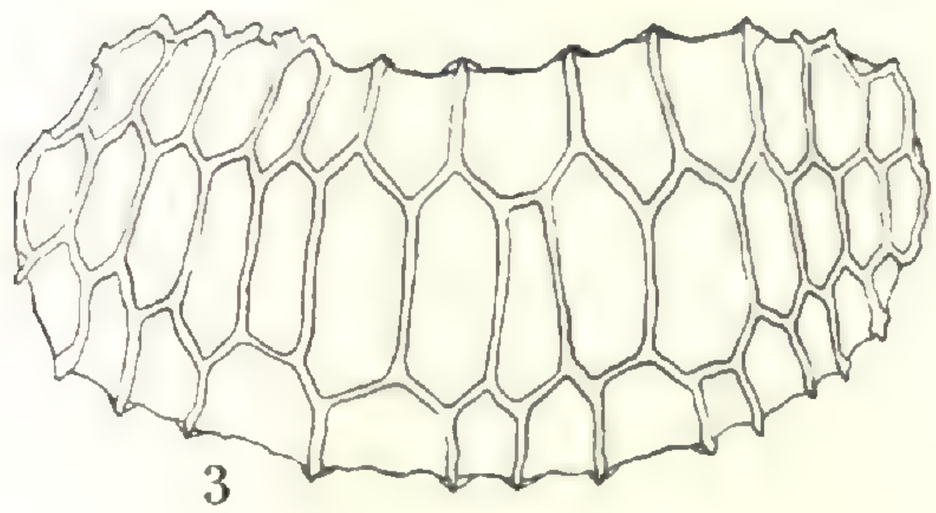

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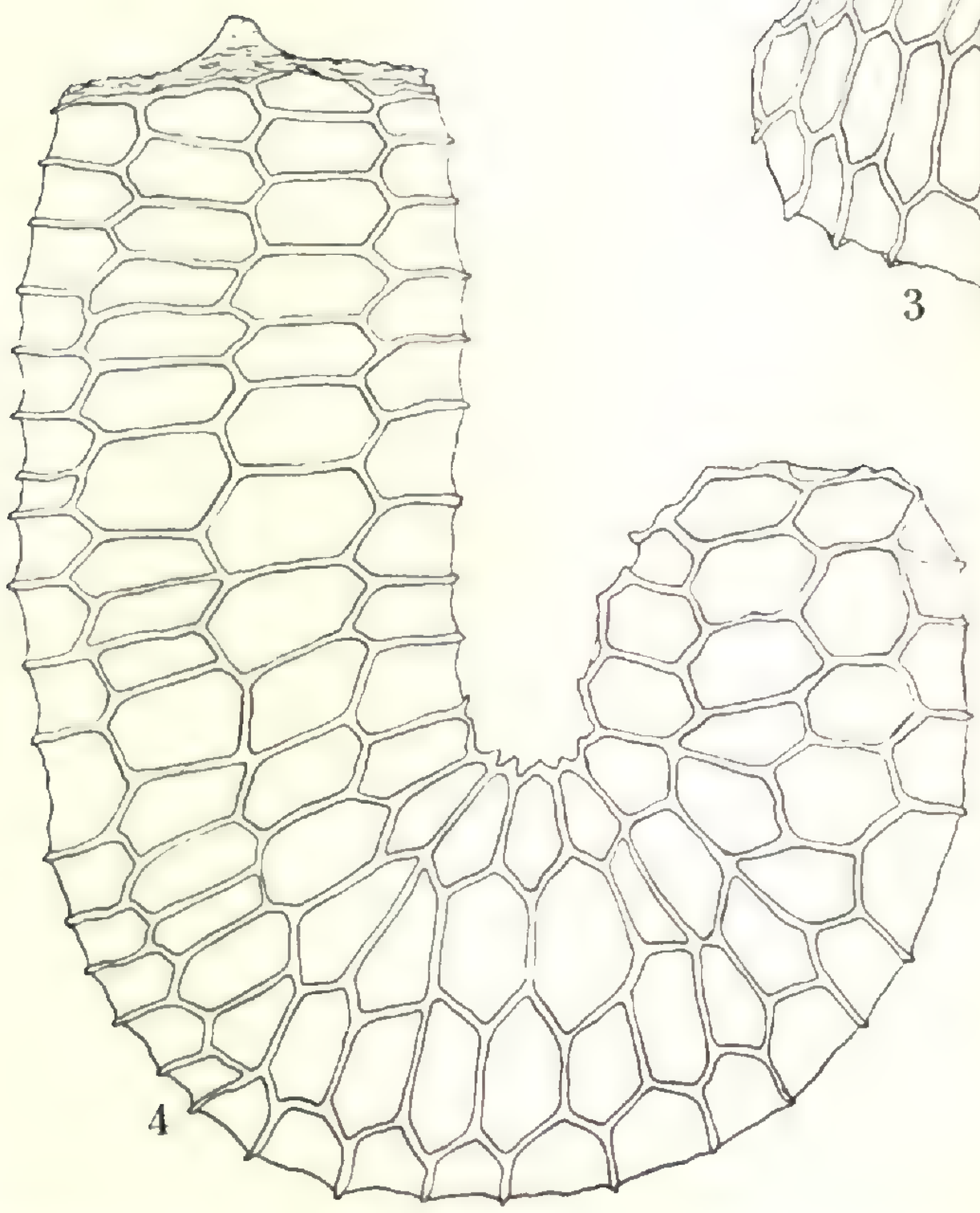
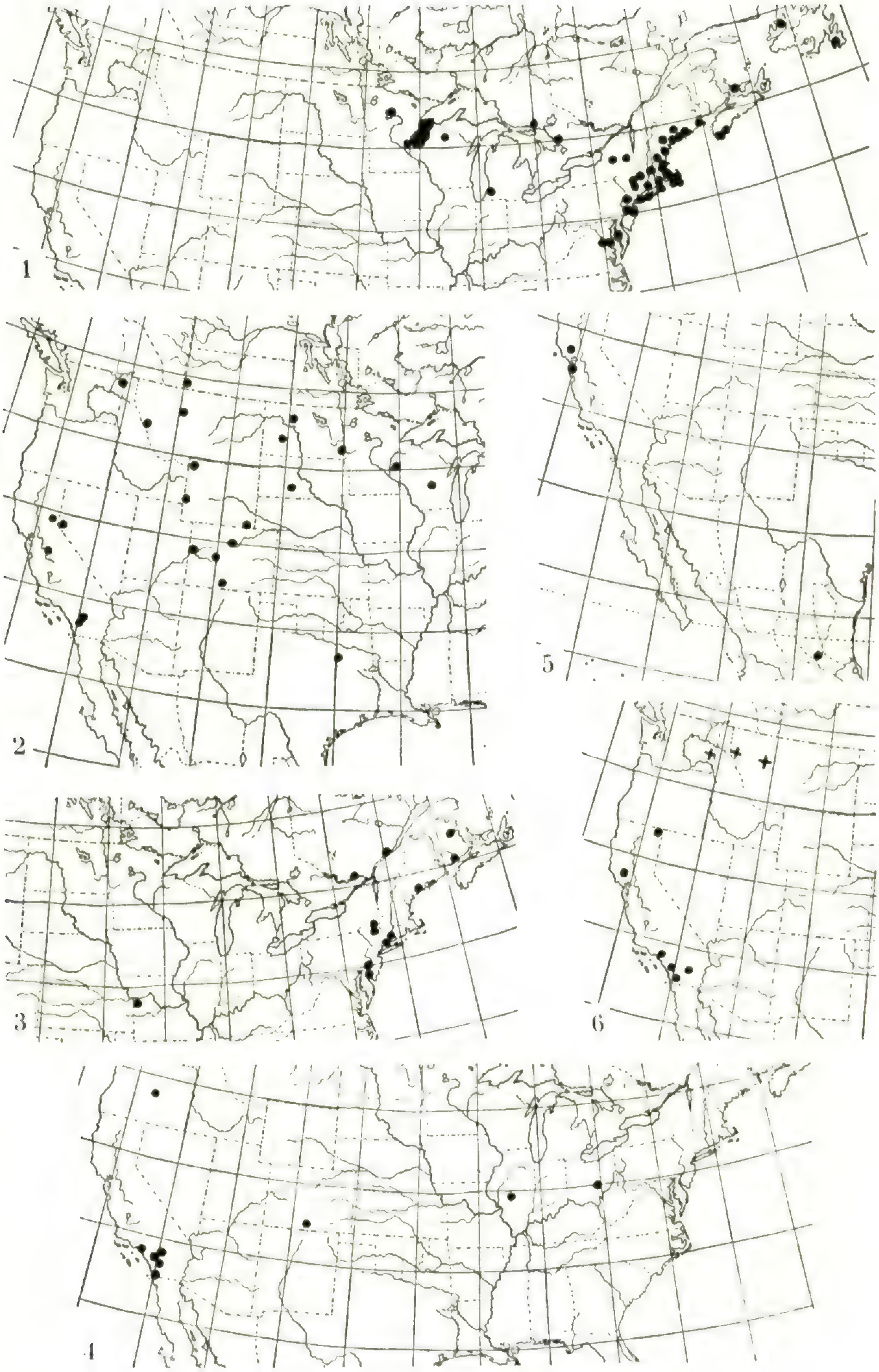


4

Seeds of ELATINE, × 100. FIG. 1, E. MINIMA; FIG. 2, E. TRIANDRA var. GENUINA; FIG. 3, E. TRIANDRA var. BRACHYSPERMA; FIG. 4, E. CALIFORNICA.



Ranges of Elatine. Map 1, E. minima; map 2, American range of E. triandra var. genuina; map 3, E. triandra var. americana; map 4, E. triandra var. brachysperma; map 5, E. triandra var. obovata; map 6 (dots), E. californica, (crosses) E. californica var. Williamsii.

ALBERTA or SASKATCHEWAN: Cypress Hills, August 3, 1880, *J. Macoun* (Gray). MONTANA: Lower Sand Coulee, August 25, 1891, *R. S. Williams*, no. 854 (Minn.); on edge of ponds, Missoula, September 11, 1898, *Williams & Griffeths* (Mo.). WYOMING: Alpine, Lincoln County, on the Snake River, near the Idaho boundary, July 9, 1923, *Payson & Armstrong*, no. 3434 (Mo.; Ia.; Gray); wet meadows, Sherman, July 19, 1889, *J. E. Bodin* (Minn.); growing on the bottom, Yellowstone Lake, 1885, *Frank Tweedy*, no. 408 (Field; Gray); muddy shore of Yellowstone Lake, 1885, *Tweedy*, no. 439 (type of *E. rubella* Rydb.) (Field; Gray). COLORADO: Denver, 1878, *M. Jones* (Mo.); near Twin Lakes, 1875, *Hayden Survey*, no. 4472 (Mo.); San Luis Valley, 1873, *John Wolf*, no. 990 (Field); Loma on Rio Grande, Col. Ter., 1873, *John Wolf*, no. 309 (Field); borders of drying pond, North Denver, September 20, 1910, *Alice Eastwood* (Gray); banks of a pond in Middle Park, 1868, *Geo. Vasey* (Gray). NEW MEXICO: mountain streams, Coppermine, 1851, *C. Wright* (Mo.). TEXAS: muddy early in the spring, Dallas County, March, 1874, *J. Reverchon* (Mo.). WASHINGTON: Usk, August 1, 1902, *Frank O. Kreager*, no. 367 (N. Y.; Minn.; Gray). OREGON: mud, Max's Boltoni below Portland, September 15, 1883, *L. F. Henderson*, no. 143 (Mo.); abundant, pond in Salem, September, 1871, *Elihu Hall* (Field); borders of ponds, Sauvies Island, October, 1874, *Joseph Howell* (Field). NEVADA: Lake Washoe, 1865, *J. Torrey*, no. 52 (N. Y.). CALIFORNIA: shallow pool, 3 miles below Helmet Valley, San Jacinto Mts., 450 ft., July 4, 1922, *P. A. Munz*, no. 5969 (Pomona); edge of water, Dry Lake, San Bernardino Mts., 9100 ft., September 23, 1922, *Munz*, no. 6282 (Pomona); baked clay soil of desiccated rain-pool, 3 miles n.w. of Merced, April 27, 1929, *John Thomas Howell*, no. 4208 (Pomona); Weber Lake, 1886, *Lemmon* (Gray). MEXICO: Mound Valley, Sierra Madre Mts., Chihuahua, alt. 7000 ft., September 16, 1903, *M. E. Jones*, no. 7321 (Gray).

E. TRIANDRA var. AMERICANA (Pursh) Fassett, RHODORA xxxiii. 73 (1931), where synonomy is given and distribution discussed.—MAP 3. The following may be added to the specimens cited by Fernald, l. c. QUEBEC: tidal mud of the St. Lawrence, Cap Rouge, September 14, 1931, *M. L. Fernald*, no. 2531 (Gray); tidal mud of the St. Lawrence, Anse St. Vallier, September 15, 1931, *Fernald*, no. 2532 (Gray). NEW BRUNSWICK: tidal shore, Kennebecasis River, Lakeside, August 25, 1923, *Svenson & Fassett*, no. 2015 (Gray); muddy tidal shore, Miramichi River, 5 miles above Newcastle, August 19, 1923, *Svenson & Fassett*, no. 2016 (Gray); tidal shores of the St. John River, Westfield, August 20, 1924, *Fassett*, no. 2288 (Gray). NEW YORK: muddy tidal shores of Hudson River, Coeymans, September 22, 1923, *Svenson* (Gray); tidal muddy shores of Hudson River, Hudson, September 30, 1923, *Svenson* (Gray). MISSOURI: common in swales, Atherton, June 27, 1898, *B. F. Bush*, no. 131 (Mo.; Field; Gray).

The station in Missouri is far removed from the essentially estuarine remainder of the range, but the writer is unable to separate the three sheets examined from the eastern plants.

E. TRIANDRA var. **brachysperma** (Gray), n. comb. *E. brachysperma* Gray, Proc. Am. Acad. xiii. 361 (1878).—MAP 4; FIG. 3.

Ordinarily this appears quite distinct from var. *genuina*, but occasional specimens are intermediate in seed characters and must be classified somewhat arbitrarily; moreover, the South American representative[1] of *E. triandra* stands just between var. *genuina* and var. *brachysperma* in many characters. These characters are as follows: *E. triandra* vars. *genuina* & *americana*, seeds 400–720 μ long and 140–250 μ thick with 6–8 rows of 16–25 pits each; var. *andina*, seeds 460–680 μ long and 160–280 μ thick with 8–10 rows of 12–19 pits each; var. *brachysperma*, seeds 350–600 μ long and 160–300 μ thick and with 6–8 rows of 9–16 pits each.

The range of var. *brachysperma* is somewhat similar to that of var. *genuina*, but most curiously disrupted; it is less common except in southern California. In the middle west it has been collected in pools in the Illinoian drift in central Illinois, and in Wisconsin drift in Ohio.

The following collections have been studied: OHIO: margin of pond 2 mi. south of Circleville, Pickaway Twp., Nov. 10, 1925, *Pontius & Bartley* (N. Y.). ILLINOIS: floating in a pond and rooting on its muddy margins, Springfield, *Bebb* (Field); floating in water, Springfield, *Bebb* (Field); Springfield, *Bebb* (other collections apparently made at different times, Mo.; N. Y.; Gray); Athens, 1861, *E. Hall* (Gray). TEXAS: [without locality] 1850, *Chas. Wright* (Mo.); in a dried up pool, Grosbeck, Limestone County, March, 1878, *J. F. Joor* (Mo.); Hempstead, 1872, *Elihu Hall*, no. 37 (N. Y.) (this number in Mo. is var. *genuina*). ARIZONA: Spring Valley, near the San Francisco Mts., September, 1884, *J. G. Lemmon*, no. 3313 (Gray). NEW MEXICO: Copper Mines, *Bigelow* (N. Y.). OREGON: Farewell Bend, Crook County, 1270 m., July 7, 1894, *J. B. Leiberg*, no. 462 (Mo.; N. Y.). CALIFORNIA: Mesas, San Diego County, April 25, 1884, *C. R. Orcutt*, no. 1402 (Mo.); in very shallow water or on the borders of it, Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish*, no. 1430 (Mo.; Field) and 1431 (N. Y.; Gray); near Santa Monica, Los Angeles County, October, 1889, *Dr. H. E. Hasse* (Field; Pomona); Bear Valley, margins of the lake, August 5, 1902, *LeRoy Abrams*, no. 2910

[1] **E. TRIANDRA var. andina, n. var., seminibus 460–680 μ longis, 160–280 μ diametro, cum 8–10 lineis 12–19-alveolis; foliis var. *genuinam* simulantibus.—Prov. Lareaja vic. Sorata, in lacunis uliginosis 1200–3100 metres reg. temp. & alpine, Andes Boliviae, *J. Mandon* (TYPE in Herb. Missouri Botanical Garden); in turfis udis montis la Leona, Rancagua, Chili, October, 1828, *Bertero*, no. 233 (Mo.).**

(N. Y.; Pomona); dessicated pools at north end, Red Hill, Upland, 1500 ft., May 22, 1922, *P. A. Munz*, no. 5557 (Pomona); dried mud flat, Menifee Valley, Riverside County, May 19, 1922, *Munz & Johnston*, no. 5569 (Pomona); Ramona, San Diego County, May 25, 1903, *Brandegee*, no. 3378 (Pomona; Gray); drying vernal pool south of Ramona, San Diego County, May 3, 1938, *Edith A. Purer*, no. 6945 (Pomona); Inglewood, Los Angeles County, April, 1901, *LeRoy Abrams*, no. 1449 (Pomona); frequent, water and on shore, Hidden Lake, San Jacinto Mts., September 6, 1922, *Munz*, no. 6379 (Pomona); drying pool 1 mile north of Laguna on bluff near club house, Laguna Beach, 200 ft., April 12, 1921, *Munz*, no. 4478 (Pomona); drying banks in wet meadows, Bluff Lake, San Bernardino Mts., 7400 ft., June 26, 1926, *Munz*, no. 10533 (Pomona); dry mud flat, Mystic Lake near Moreno, 1500 ft., June 21, 1921, *Munz & Johnston*, no. 5546 (Pomona).

E. TRIANDRA var. **obovata**, n. var., seminibus eis var. *brachyspermi* simulantibus; foliis obovatis apice rotundatis 2–5 mm. longis 1.5–2 mm. latis.—MAP 5.—CALIFORNIA: Jordan's Pond, Kelseyville, July 3, 1929, *J. W. Blankinship* (TYPE in Herb. Missouri Botanical Garden); Presido, May, 1891, *Michener & Bioletti* (Gray). MEXICO: near Morales, San Luis Potosi, 1879, *Wilh. Schaffner* (N. Y.); same, no. 464 (Pomona; Minn.; Ia.) and 1876, no. 122 (Gray).

This stands to var. *brachysperma* as var. *americana* does to var. *genuina*. It seems to replace other forms in two widely separated areas.

E. CALIFORNICA Gray, Proc. Am. Acad. xiii. 361 (1878).—MAP 6, dots.—CALIFORNIA: vernal pool, Camp Kearney, Mesa, March 2, 1937, *Edith A. Purer*, no. 7116 (Mo.); submerged, Jordan's Pond, Kelseyville, July 3, 1929, *J. W. Blankinship* (Mo.); near Soldier's House, Los Angeles County, September, 1889, *Dr. E. E. Hasse* (Mo.; Gray); on sunny shore and in shallow water, South Mt. Reservoir, Devil's Garden, alt. 5000 ft., Modoc County, August 23, 1935, *Louis C. Wheeler*, no. 3913 (N. Y.); Santa Monica, *Hasse* (N. Y.; Pomona); mud at lake edge, Laguna Cañon, May 4, 1918, *I. M. Johnston* (Pomona); edge of small pool on Garner Ranch, 4550 ft., Helmet Valley, San Jacinto Mts., May 21, 1922, *Munz & Johnston*, no. 5520 (Gray; Pomona); muddy bank, Laguna Lake, San Diego County, 5000 ft., June 25, 1924, *Munz*, no. 8392 (Pomona); common on wet shore, Cuyamaca Lake, San Diego County, 4600 ft., June 27, 1923, *Munz & Harwood*, no. 7221 (Pomona); shallow pool, Kenworthy, San Jacinto Mts., 4750 ft., May 20, 1922, *Munz & Johnston*, no. 5460 (Pomona); drying mud-flat, ½ mile south of Lake Elsinore, April 29, 1922, *Munz & Johnston*, no. 5066 (Pomona); Sierra Valley, February, 1878, *J. G. Lemmon* (TYPE in Gray Herbarium).

E. CALIFORNICA var. **Williamsii** (Rydb.), n. comb. *E. Williamsii* Rydb. Mem. N. Y. Bot. Gard. i. 260 (1900).—MAP 6, crosses.—WASHINGTON: Spokane, in dried-up pond-bottoms, June 25, 1897,

C. V. Piper, no. 2643 (Gray); borders of ponds, Spokane County, June 28, 1884, *W. N. Suksdorf*, no. 640 (Mo.; Field) and 258 (Gray). Montana: Missoula, September 8, 1894, *Williams & Griffeths* (Mo.); Sand Coulee, Big Belt Mts., August 25, 1891, *R. S. Williams* (Mo., marked "855 & 844," "Type"); lake in Lower Sand Coulee, September 3, 1891, *R. S. Williams*, no. 855 (Gray, marked "Type specimen"; N. Y.; Minn.).

Rydberg characterizes this as differing from *E. californica* by being "more slender, with thinner leaves and much smaller seeds," differences which the writer must admit his inability to see.

Hypericum boreale (Britton) Bicknell, f. **callitrichoides**, n.f., plantae submersae, simplices, steriles; caule flexili; foliis rotundatis, 3–6 mm. longis, trinerviis, fere sine punctis pellucidis.—Completely submerged, quiet cove, Damariscotta Lake, Jefferson, Maine, August 22, 1936, *Fassett*, no. 18068 (type in Herb. University of Wisconsin); Bass Lake, Summit Lake P. O., Wisconsin, June 22, 1932, *J. H. Steenis & L. R. Wilson* (Wis.).

H. ellipticum Hook., f. **submersum**, n. f., plantae submersae, simplices, steriles; foliis rotundatis vel ovatis, penninervatis, interdum pellucido-punctatis.—In shallow water, Pipe Lake, Jack Wilson's Resort, Walford, Ontario, August 5, 1936, *Fassett*, no. 19172 (type in Herb. University of Wisconsin).

Most collecting has been done, obviously, for herbaria, with emphasis on well-developed flowering or fruiting specimens. With the present interest in conservation, however, much collecting is taking the form of an inventory of aquatic vegetation. In some lakes the forms here described are as definitely a part of the flora as is the *Callitriche* they resemble. Often, such aquatic derivatives of terrestrial plants lose the characteristics by which their normal forms are most readily identified: *H. boreale* lacks the pellucid dots ordinarily associated with a *Hypericum; Pontederia cordata* f. *taenia*[1] can scarcely be told from a *Sparganium*, and *Gratiola lutea* f. *pusilla*[2] is quite without the glands which dot the ordinary *G. lutea*.

Didiplis diandra (Nutt.) Wood, f. **terrestris** (Koehne) n. comb. *Peplis diandra* f. *terrestris* Koehne in Engler's Bot. Jahrb. i. 264 (1881).

D. diandra f. **aquatica** (Koehne) n. comb. *P. diandra* f. *aquatica* Koehne, l. c.

Peplis diandra Nutt. in DC. Prod. iii. 77 (1828), is described as having leaves subalternate toward the apex, 2 stigmas, and 2 stamens. Although this is an inaccurate discription of the plant known as

[1] Fassett, Rhodora xxxix. 274 (1937).
[2] Pennell, Acad. Nat. Sci. Phila. Monographs i. 76 (1935).

Didiplis, or *Peplis*, *diandra*, the name is probably correctly applied. A specimen from the Academy of Natural Sciences of Philadelphia has been kindly loaned by Dr. Pennell; this sheet is marked "*Ptilina aquatica*" by Nuttall, and is a mixture of the two forms mentioned above. This sheet does not represent, in all probability, the type, which appears to have been sent to De Candolle.

LUDWIGIA PALUSTRIS (L.) Ell., var. AMERICANA (DC.) Fern. & Grisc., forma **elongata**, nom. nov. *Ludvigia palustris*, f. *submersa* (Glück) Eames, sensu Eames, RHODORA XXXV. 229 (1933), not *Isnarda palustris*, f. *submersa* Glück, Biol. & Morph. Unterschungen Wasser- und Sumpfgewächse iii. 155 (1911).

PHYSOSTEGIA **granulosa**, n. sp., planta stolonifera; foliis spatulato-oblanceolatis utrinque 4–8-dentatis; foliis superioribus reductis calycibus granulis densis vel capillis brevissimis instructis; floribus 20–25 mm. longis.—Plants stoloniferous; leaves spatulate-oblanceolate, with 4–8 pairs of teeth; calyx with dense minute gland-like hairs, each 2–3 times as long as thick.—QUEBEC: Cap Rouge, Co. de Quebec; grèves estuariennes, avec *Gentiana Victorinii*, *Bidens hyperborea*, *Isoetes Tuckermani*, etc., 21 août 1928, *F. Marie-Victorin*, no. 28178 (TYPE in Herb. Univ. of Wisconsin); Cap Rouge, rivage estuarien, avec *Gentiana Victorinii*, apparamment atteint par la marée, 19 août 1925, *F. Marie-Victorin*, no. 21570.

This estuarine plant has the reduced upper leaves and large flowers of *P. virginiana*, as defined by Deam,[1] is stoloniferous like *P. speciosa*, has fewer teeth on the leaves than either, and a peculiar pubescence on the calyx unlike that of either. It is described[2] and illustrated[3] by Frère Marie-Victorin, who states that it is confined to tidal shores.

P. SPECIOSA Sweet, var. **glabriflora**, n. var., floribus 16–20 mm. longis omnino glabris vel sparse brevissimeque puberulentibus; lobis calycis ciliatis.—Racine, WISCONSIN, *T. J. Hale* (TYPE in Herb. Univ. of Wisconsin).

Hale collected about 1861, and it is probable that this plant no longer exists about Racine. His collection consists of two plants in full flower, which differ strikingly from the usual *P. speciosa* in their lack of the velutinous indument of the calyx, and of the white pubescence ordinarily conspicuous, at least on opening buds, and usually on the mature corolla.

[1] Flora of Indiana, soon to be published. The writer is indebted to Mr. Deam for a copy of the manuscript of the part of the Flora dealing with this genus.

[2] Flore Laurentienne, 498 (1935).

[3] Ibid., 497.

ON THE TYPIFICATION OF LINNEAN SPECIES AS ILLUSTRATED BY POLYGALA VERTICILLATA

Francis W. Pennell

So again a proposition of mine has come under censure in the pages of Rhodora,[1] and this time quite deservedly so! After publishing my account of "'Polygala verticillata' in Eastern North America" in 1931,[2] I realized that the situation had not been fully or correctly met, but I have hoped that a restudy of the matter in 1933, entitled "Polygala verticillata and the Problem of typifying Linnean Species,"[3] has adequately covered the ground. If Professor Fernald had consulted this paper, perhaps we would be nearer agreement. As he did not do so and as its argument seems to me worth bringing to the attention of readers of Rhodora, I ask his permission to discuss this special instance yet again.

Polygala verticillata forms an ideal text for considering the problem of typifying Linnean species, because on good logic the name may be assigned to any of *three* species. If one gives precedence to the description of the inflorescence the name must, as the late Kenneth K. Mackenzie contended,[4] be given to *Polygala ambigua* Nutt. If one takes as determinative the plant in Linnaeus' herbarium, the name must go, as Professor Fernald contends, to my *P. pretzii*. But if one studies the historical antecedents it passes, as I urged in 1931 and again in 1933, to what I have considered as true *verticillata* and Fernald as var. *isocycla*.

These three species in constancy of characters, lack of intergradation, and differing areas of occurrence seem to me amply distinct specifically. After a long probation *Polygala ambigua* is now generally so recognized. If their behavior in the Philadelphia area be indicative, the other two, although closely associated, must be given equal rank, and they will be so considered in this discussion. In the following key, which is repeated from the 1931 paper so as to bring clearly before us the characteristics of all three, these are contrasted. Since it does not affect the problem of typification, I have omitted *P.*

[1] Rhodora **40**: 395. Sept., 1938.
[2] Bartonia **13**: 7–17, *pl.* 2–3.
[3] Bartonia **15**: 38–45.
[4] In a letter received soon after the appearance of my 1931 paper. It was in reply to his suggestion that my second paper was written. He first called my attention to my stupid mistranslation of the phrase "spicis floribus remotis," saying that it could only denote *Polygala ambigua*.

verticillata sphenostachya, and slightly changed the characterization of *P. verticillata*. Illustrations of the three species, which I regret can not be reproduced here so that the reader may have them all equally before him, were given in Bartonia.

Raceme seemingly conic, the fruits soon falling so that the flowers and fruits present are crowded into a space 0.5–1.5 cm. long; 'wings' shorter than the mature capsule; seed about twice as long as wide, the aril usually over half its length; leaves mostly or wholly verticillate.
- Seed finely pubescent; capsule about 1 mm. long, on a pedicel ¼ to ⅓ its length; raceme narrow, dense, the sepals greenish-white; plant usually 1–2 dm. tall, with widely spreading branches and the racemes on peduncles 0.5–4 cm. long . . . . . *P. verticillata.*
- Seed hirsute; capsule about 1.5 mm. long, on a pedicel ⅓ to ½ its length; raceme wider and looser, the sepals often purplish; plant usually 2–3 dm. tall, with ascending branches and the racemes on peduncles 2–7 cm. long . . . . . *P. pretzii.*

Raceme long-cylindric, slender, the fruits more persistent so that the flowers and fruits present are scattered (the lower remote) in a very narrow slender raceme 1–5 cm. long; 'wings' about equaling the mature capsule; seed mostly thrice as long as wide, the aril usually less than half its length; leaves mostly or all alternate or scattered on the stem and virgate branches . . . . . *P. ambigua.*

For our problem let us next see the full wording of Linnaeus' original description of *Polygala verticillata*,[1] as published in 1753:

"*verticillata.* 21. POLYGALA floribus imberbibus, spicis floribus remotis, foliis linearibus verticillatis, caule herbaceo ramoso.

Polygala caulibus filiformibus, foliis linearibus alternis, pedunculis spicatis. *Gron. virg.* 172.

Polygala foliis imberbibus spicatis, caule erecto herbaceo filiformi ramoso, foliis linearibus. *Amoen. acad.* 2. *p.* 159.

Polygala mariana quadrifolia minor, spica parva albicante. *Pluk. mant.* 153. *t.* 438, *f.* 4.

Polygala quadrifolia minima marilandica, spicis florum parvis albentibus. *Raj. suppl.* 639.

Habitat in Virginia.

Folia *saepius quina ad genicula, interdum alterna. Spicae albae, angustissimae flosculis remotis.*"

Of this description the account of the inflorescence and the reference to Gronovius' "Flora Virginica," with the geographic statement of occurrence, all pertain to *Polygala ambigua.* 'Spikes with remote flowers' and 'Spikes white, very narrow, with remote little flowers' can only denote this species. Only this has the flowers truly white, a feature due to the expanded 'wings' of the perianth. Gronovius, who

[1] Species Plantarum 706.

it will be recalled was aided in Holland by Linnaeus in his younger days, based his polynomial[1] on John Clayton's number 563 from the Coastal Plain of Virginia, a specimen which I studied at the British Museum in 1930 and have since had verified anew by Mr. George Taylor of that institution. It is excellent *P. ambigua*, with the leaves nearly all alternate, the description (which may be counted as Linnaeus' own) showing that the slight whorling of those in the lowermost cluster had been overlooked. Evidently this alternate phyllotaxy was considered as atypical by Linnaeus, as in 1753 it was omitted from the essential diagnosis and only covered by the phrase "folia . . . interdum alterna"—'leaves sometimes alternate.' We are told that the species has its 'leaves usually[2] five to a node.' If Linnaeus had not placed such emphasis upon whorled phyllotaxy as especially characterizing his species, I should consider that its *ambigua* component should be accounted basic for *Polygala verticillata.*

In Linnaeus' own herbarium the only specimen of "Polygala verticillata," and that received, as Professor Fernald states, two years before the publication of the "Species Plantarum," was one gathered by Kalm at some unrecorded spot, but certainly much to the north of Virginia. It also I saw when in London in 1930. The specimen, which is my *P. pretzii*, shows well the whorled phyllotaxy demanded by Linnaeus' specific name. Professor Fernald considers it the true type. Why should we hesitate in assuming that this was the actual collection that was most carefully studied by Linnaeus for his account of *Polygala verticillata?*

Certainly it was not Kalm's plant from which Linnaeus drew his description of the inflorescence of *Polygala verticillata*, for we have just seen that this vital part of his diagnosis was based upon material of *P. ambigua.* We may well ask ourselves why, if he had Kalm's specimen before him, did Linnaeus ignore its flowers and describe instead another species which has not survived in the Linnean Herbarium at all. The most ready explanation is that, *at the time of drawing up his diagnosis for the "Species Plantarum,"* Linnaeus had not yet seen Kalm's plant, but had at hand either a specimen or notes[3]

[1] Flora Virginica 172. 1743.

[2] The force of "saepius," a comparative adverb, is stronger than 'often,' as translated by Professor Fernald.

[3] As it is said that Linnaeus sometimes gave away specimens when they had been replaced in his herbarium by better representation of the species concerned, it may be that the Clayton material was so discarded when that of Kalm was later added. Or it is known that in the later years at Hammerby many specimens had to be discarded

that described the inflorescence of Clayton's Virginia collection. The features descriptive of the latter are not quoted from Gronovius' "Flora Virginica," but are new information now first placed in print. So decidedly does Kalm's plant contradict this characterization that one suspects that, if the two collections had been actually compared for the diagnosis of the "Species Plantarum," Linnaeus would have realized their distinctions, and that the Virginia component need not have awaited description for nearly seventy years longer. But how is it possible that Linnaeus did not depend more upon Kalm's plants, since he had actually sent this student to North America and was eagerly awaiting what he would gather?

I gladly grant all Linnaeus' fostering interest in Kalm's travels. Kalm's collections were received in June, 1751, and so keenly interested was Linnaeus in them that we are told how, although previously quite sick, "he rose from his bed, and forgot his troubles."[1] There is no question of his having identified Kalm's plants, and having incorporated into the "Species Plantarum" a large number of new species from them. But this does not mean, as would be implied by Professor Fernald's emphasis upon the supreme importance of the Kalm plants, that Linnaeus overhauled the descriptions which he had already formulated so as to incorporate ideas from Kalm's specimens. Only on such an assumption can we reasonably accept Kalm's specimens as typifying Linnaeus' species, without first asking the question, "Was that description likely drawn before, or after, the incorporation of Kalm's material into Linnaeus' herbarium?"

Supposing any of us, who were incidentally as busy teachers as he, were engaged upon tasks so colossal and encyclopaedic as Linnaeus, is it likely that we could find time for drastic revisions as new material arrived? What was Linnaeus' normal course may be seen by comparing the same group through the several editions of his companion work, the "Genera Plantarum." This I have done for the Scrophulariaceae, and a study of the "Genotypes of the Scrophulariaceae in the First Edition of Linné's 'Species Plantarum'"[2] revealed the significant fact that once he had formulated the description of a genus it was rarely revised, but passed unaltered through each suc-

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because of damp or rodents. Or it may be that, even from the time of his visit to Holland from 1735 to 1738, Linnaeus had been assembling descriptive notes toward what later became his "Species Plantarum."

[1] Jackson, B. D., Linnaeus. p. 332. 1923.

[2] Proc. Acad. Nat. Sci. Phila. **82**: 9–26. 1930.

ceeding edition of the "Genera Plantarum."[11] Why this is so is evident enough when we consider the vastness of the tasks upon which he was engaged. Rarely indeed could he stop to revise or retouch his work.

I think that it is safe to assume that the parts of the "Species Plantarum" which were prepared before the summer or early autumn of 1751[12] will include only the new species based upon Kalm's collections, but rarely, if at all, old diagnoses modified to accord with his specimens. But the parts which were prepared after the incorporation of these specimens should show much dependence upon them, both for new and old species. Accordingly, we need to know what progress was being made by Linnaeus, and for our especial problem we wish to know just when he likely prepared his account of *Polygala verticillata.*

Perhaps full information of Linnaeus' progress on the text of the "Species Plantarum" is somewhere forthcoming, but all I have now at hand is what is given in Dr. B. Daydon Jackson's "Linnaeus."

[11] For the "Genera Plantarum" most generic descriptions commenced with the first edition in 1737, but my comparisons were made between the second edition in 1742 and the fifth in 1754. Linnaeus gave only generic descriptions, which were based wholly upon the structure of the flower and fruit. "These descriptions . . . rarely cover a whole generic concept, as do those of modern workers; only in the case of *Antirrhinum*, which was consciously built up of three earlier genera, *Linaria*, *Antirrhinum* and *Elatine*, am I certain that we have such a broad diagnosis." By comparing the generic diagnoses with the characters of the included species given in the "Species Plantarum" it becomes apparent—in those cases where there is appreciable floral contrast between the species—that the diagnoses fit only one or a few of the species. More than this, a study of what was available to Linnaeus makes it certain that his customary procedure was to select a certain illustrative species, and from it describe his genus. Thus, the diagnosis of *Veronica* was drawn from *V. officinalis*, which also on historical grounds should have been the genotype; *Gratiola*, similarly from *G. officinalis; Rhinanthus*, from *R. crista-galli; Pedicularis*, however, from *P. sylvatica*, etc. Evidently, his illustrative species were chosen with much care, and so they ideally meet the modern desire for typification of his genera. In fact, they may stand as Linnaeus' own selection of typical species for his genera. In only two cases in the Scrophulariaceae are they at variance with what subsequently became general usage. The diagnosis of *Bartsia* applies only to *B. coccinea*, thus making it evident that this name should have been continued for what we have come to call *Castilleja;* and that of *Gerardia*, a genus adopted from Plumier, applies solely to *G. tuberosa*, the species of Plumier which has since proved to belong to the Acanthaceae. In these cases I think that the names should either be assigned according to the species indicated by the generic diagnosis, or else rejected from nomenclature; surely no species should be chosen as typical of a genus which flagrantly contradicts the accompanying diagnosis of that genus! Efforts to typify Linnean genera have been too largely bibliographic and mechanical; it is to be regretted that Linnaeus' method in the "Genera Plantarum" was not realized long ago, and most of the species behind his diagnoses clearly revealed. (For a fuller discussion, with suggestions for procedure where floral characters are so uniform that no species is selected by the generic diagnosis, etc., the reader is referred to my paper of 1930.)

[12] Allowing requisite time for the sorting and preparation of Kalm's material after its arrival in June.

On page 273 we learn that the "Species Plantarum" was begun in 1746, and on it Linnaeus "laboured day and night" till 1748. Then he paused, but a year later he was again at work. "He reached *Poa* in a week; five months later he reached Icosandria. Early in 1752 he was engaged on Syngenesia, and in August of the same year, he thankfully recorded that he had finished writing the whole book." *Polygala* comes after Icosandria, but long before Syngenesia. Assuming a relatively even rate of progress this would seem to place its composition in the latter part of 1750 or the first half of 1751, thus somewhat before the probable incorporation of Kalm's plants. As this is in accord with the fact that Kalm's specimen was not used in characterizing the inflorescence, I think that we may reasonably infer that it reached Linnaeus too late to have played any part in his description of this species.

If he had not yet studied Kalm's plant, and if Clayton's plant does not meet the most important essential of Linnaeus' diagnosis, what had Linnaeus seen to make him adopt so positively the name *Polygala verticillata* for his species? Doubtless we go a step earlier in Linnaeus' thinking (since the views of his students were so largely his own reflected back to him) when we consult the thesis on "Radix Senega" by Jonas Kiernander, which was defended before Linnaeus at the University of Uppsala on April 8, 1749, then issued as a separate paper in 1749 or 1750, and which finally appeared in the Amoenitates Academicae in 1751. This is but a trivial step however, as, although the diagnosis lacks the "spicis floribus remotis" of Linnaeus' later one, it included the same citations as Linnaeus was to use, including that to Gronovius and so to the collection from which it seems likely that Linnaeus drew this bit of knowledge. So we may pass by Kiernander to his and Linnaeus' common antecedents.

Of the Linnaean citations there now remain only those to Plukenet and to Ray. "The details of their diagnoses are surprisingly alike, Plukenet's translating: 'Four-leaved smaller Maryland Polygala, with small whitish spike'; and Ray's: 'Four-leaved very small Maryland Polygala, with spikes of flowers small and whitish.' They might have been based upon the same collection, and so I believe they were. Leonard Plukenet, in his 'Almagesti Botanici Mantissa,' published at London in 1700, said a little more than Kiernander and Linnaeus later quoted, informing us that his plant was collected by Dr. Krieg; he further illustrated it in his "Almatheum Botanicum" of 1705,

showing its identity unmistakably. John Ray, in the third volume (or 'Supplementum') of his 'Historia Plantarum,' published at London in 1704, gave the diagnosis later quoted by Kiernander and Linnaeus, and added a remark that translates: 'This little plant is strongly branched, at the nodes of the stem sending out four or five narrow oblong little leaves. In the highest stems and branches it offers graceful oblong spikes, composed of whitish little flowers.' My reason for suspecting that this account was also based upon Krieg's collection is that in his preface Ray acknowledged indebtedness to Dr. David Krieg, a German, for plants gathered in Maryland. The date of Krieg's collection was probably little before 1700, as both Plukenet and Ray included his plant in lists supplementary to their main texts of some ten years earlier. Krieg's specimen is preserved at the British Museum, and Mr. Taylor assures me that it is wholly the first species of my paper of 1931, sustaining the identification that I had readily made from the illustration and texts. Both Plukenet's illustration and Ray's notes show that the leaves may be in fives as well as fours, thus modifying one word of their diagnoses to fit Linnaeus' remark of 'folia saepius quina'."

My conclusion now is the same as in 1933. "It is this element, the first-known historically, to which I still incline to apply the name *Polygala verticillata*. It does not fit Linnaeus' description of the flowering spike or his citation of locality, but I think that those difficulties are more than balanced by the emphasis that we should place upon the source of the name chosen. The 'Species Plantarum' has appealed to posterity as the beginning of nomenclature and descriptions, but it was not so to the master-botanist who composed it. Linnaeus felt himself a reformer, rather than originator; he was busied with assembling the many descriptions that preceded his work and organizing them under a simpler method of labeling. I think that he would have told us that his name 'verticillata' was here selected because it was more appropriate than was 'quadrifolia,' and that he thought of his species as being essentially the successor of that of Plukenet."

Academy of Natural Sciences,
Philadelphia.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXVI

I. SOME NOTES ON THE BOTANICAL RELATION BETWEEN NORTH AMERICA AND EASTERN ASIA

HIROSHI HARA

On making a critical comparison between North American plants and eastern Asiatic ones, I recognized that the plants on both continents are often closely related, as many authors have already pointed out. Here I want to explain some cases in which several questions have until now remained unsettled.

My study is being carried on in the Gray Herbarium under the supervision of Prof. Fernald to whom I wish to express my heartiest gratitude for his very kind and helpful advice.

1. RANUNCULUS GMELINI AND R. PURSHII.—The relation between the two was discussed in detail by Litvinow in Sched. Fl. Ross. in 1922, but more recent authors have often disagreed with his opinion. Hultén stated in the note under *R. Gmelini* in his Fl. Kamt. II that the closely related *R. Purshii* Hooker, extending throughout N. America, is probably to be regarded as a separate species, although he referred Alaskan material to *R. Gmelini*, while Komarov adopted the name *R. Purshii* for his Kamchatkan material. Ovczinnikov as well as American authors have treated all Asiatic material as *R. Gmelini* and all American as *R. Purshii*. To settle the question, I compared a large number of American specimens with those from Jakutsk, Transbaicalia, Kamchatka and Saghalien, but I did not find any constant characters by which these could be separated into two distinct species.

I found that some American specimens, for example those from Minnesota and Michigan, agree exactly with the Asiatic plant. So I think that both plants, American and Asiatic, can not be distinguished as independent species. The American ones, however, have generally more robust growth and thicker stems, larger leaves with broader lobes, larger flowers, broader petals and a larger fruit-cluster, with a globular receptacle, and they may be called *R. Gmelini* var. *Purshii* (Hook.). An emersed form which is strongly hairy and is not known from Eastern Asia is var. *limosus* (Nuttall), and another emersed form endemic in N. America is var. *prolificus* (Fernald).

Ranunculus Gmelini DC., Syst. Veg. I, p. 303 (1818); Schlechtendal, Animadv. Ranuncul. Candol. II. p. 35 (1820); DC., Prodr. I, p. 35 (1824); Litvinov in Sched. Herb. Fl. Ross. VIII, p. 53 (1922); Hultén, Fl. Kamt. II, p. 125 (1928); Ovczinnikov in Komarov. Fl. URSS. VII, p. 354 (1937).—*Ranunculus foliis duplicato trifidis*, etc. J. Gmelin, Fl. Sibir. VI, p. 203, t. 83a, fig. B (1769). *R. pusillus* (non Poiret 1804) Lebebour in Mém. Acad. Imp. Sci. St.-Pétersb. V, p. 546 (1815). *R. Langsdorfi* DC., Prodr. I, p. 34 (1824). *R. sibiricus* Sprengel, Syst. II, p. 652 (1825). *R. Purshii* (non Richardson) Koidzumi, Fl. Saghal. Nakahara p. 65 (1910); Komarov, Fl. Penin. Kamt. II, p. 137 (1929). *R. multifidus* (non Pursh) Nakai in Bot. Mag. Tokyo XXI, p. 126 (1907). *R. Faurici* Léveillé in Fedde, Rep. VII, p. 101 (1909). *R. radicans* (C. A. Meyer) Miyabe et Miyake, Fl. Saghal. p. 13 (1915); Kudo, Rep. Veg. N. Saghal. p. 136 (1924).

Nom. Jap. Karakusa-kinpôge.

Var. **Purshii** (Richardson), comb. nov. *R. Purshii* Richardson in Franklin, 1st. Journ. App. ed. I, p. 741 (repr. p. 13) (1823) and App. ed. 2, p. 751 (repr. p. 23) (1823); Hooker, Fl. Bor.-Amer. I, p. 15, t. 7. B (1833); Torrey et Gray, Fl. N. Amer. I, p. 19 (1838); A. Gray, Synop. Fl. N. Amer. I, p. 24 (1895); Fernald in Rhodora XXXVIII, p. 173 (1936). *R. yukonensis* Britton in Bull. New York. Bot. Gard. II, p. 169 (1901).

Var. **limosus** (Nuttall), comb. nov. *R. limosus* Nuttall in Torrey et Gray, Fl. N. Amer. I, p. 20 (1838). *R. multifidus* var. *limosus* (Nuttall) Lawson, Rev. Canad. Ranuncul. p. 47 (1884).

Var. **prolificus** (Fernald), comb. nov. *R. multifidus* var. *terrestris* Gray, Man. ed. 5, p. 41 (1867). *R. Purshii* var. *prolificus* Fernald in Rhodora XIX, p. 135 (1917).

2. Circaea quadrisulcata (Maximowicz) Franchet et Savatier, Enum. Pl. Jap. I-1, p. 169 (1874) quoad syn. tantum, excl. specim. et icon.—*C. lutetiana* (non L.) auct. Asia-orient. *C. lutetiana* L. f. *quadrisulcata* Maximowicz, Prim. Fl. Amur. p. 106 in textu (1859). *C. lutetiana* L. var. *quadrisulcata* Maximowicz ex Ascherson et Magnus in Bot. Zeit. XXVIII, p. 783 (1870). *C. lutetiana* subsp. *quadrisulcata* Maximowicz, l. c. p. 787 (1870). *C. mollis* Sieb. et Zucc. var. *Maxi-*

mowiczii Léveillé in Bull. Geogr. Bot. XXI, p. 223 (1912). *C. Maximowiczii* (Lév.) Hara in Journ. Jap. Bot. X, p. 598, f. 13 (1934).—Bracteæ inconspicuæ punctatæ. Sepala vulgo fusco-rubra glanduloso-pilosa. Petala vulgo rosea.

var. **canadensis** (L.), comb. nov. *Circaea lutetiana* (non L.) auct. Amer. *C. lutetiana* β. *canadensis* Linnaeus, Sp. Pl. ed. 1, I, p. 9 (1753). *C. latifolia* Hill, Brit. Herb. p. 138 (1756) nomen illegitimum; Fernald in Rhodora XVII, p. 222 (1915); l. c. XIX, p. 87 (1917).—Bracteæ minutæ saepe setaceæ. Sepala vulgo viridia parce glanduloso-pilosa vel glabrescentia. Petala vulgo alba.

3. Galium trifidum.—In Europe, *Galium trifidum* L. is represented by a single form, but in North America and eastern Asia it differentiates into several forms. In 1897, Wiegand described two varieties from western North America, var. *subbiflorum* and var. *pacificum*, the former as having larger narrow leaves and sometimes stout nearly glabrous and rarely 2- or 3-flowered pedicels, and the latter as having larger and broader leaves, and capillary, scabrous, solitary and arcuate pedicels. The differences between the two varieties are, however, rather mechanical, and we sometimes meet with such a specimen as we can not decide to which variety it should be referred. Even Wiegand himself seems not to be sure in separating the two varieties. In the note of the original description of var. *pacificum*, he added that some Washington specimens had nearly glabrous pedicels, and in Rhodora XII, p. 229, that var. *subbiflorum* had often very slightly prickly peduncles. Besides that, the specimen from California (*Parish* no. 1505, 1882) which was cited in the original description of var. *subbiflorum* was later identified as var. *pacificum* by Wiegand himself. On examining the specimens identified by Wiegand, I found a form with narrow leaves or with short 3-rayed peduncles in his var. *pacificum*, and a form with broad leaves in his var. *subbiflorum*. Hultén recently reported from western North America subsp. *columbianum* (Rydberg) which was said to differ from var. *pacificum* by having 5 or 6 leaves in the upper whorls and 2- or 3-flowered pedicels, but those differences are also artificial and the authentic specimens of var. *pacificum* sometimes show the same characters. Thus the three plants from western North America above mentioned should be united under the name of var. *pacificum*, I think, and this variety should be separated from typical *G. trifidum* by a little more robust habit, and by having pedicels glabrous or slightly scabrous, sometimes shorter and 2- or 3-flowered, and larger leaves which have a tendency to number 5 in a whorl. It is distributed

widely from North America to eastern Asia, and var. *brevipeduncula-tum* Regel (1861) from Ussuri may be identical with it, although its brief description is not enough to settle the question. Another trouble is that var. *subbiflorum* recently has been treated as a variety of *G. tinctorium* L. (*G. Claytoni* Michx.). I have examined a multitude of specimens but have failed to find any constant differences between var. *pacificum* (including var. *subbiflorum*) and *G. tinctorium* as well as those between var. *pacificum* and *G. trifidum*. *G. tinctorium* in this typical form is clearly distinguished from *G. trifidum* by its robust growth, its leaves generally in 5 or 6's, its short pedicels straight and glabrous in 3-rayed bracteate umbels, but both plants are connected through var. *pacificum* by a complete series of intermediate forms. Therefore, judging from the material examined, I conclude that the plants above discussed should belong to a single circumpolar species differentiated into 3 geographical varieties or subspecies, the typical *G. trifidum* in Europe and North America, var. *pacificum* in North America and Eastern Asia, and the other extreme, subsp. *tinctorium* (L.), endemic in eastern N. America. The above synonymy is briefly summarized as follows:

Galium trifidum L. Sp. Pl. ed. 1, I, 105 (1753); Wiegand in Bull. Torrey Bot. Cl. XXIV, 399 (1897).

Var. pacificum Wiegand in Bull. Torrey Bot. Cl. XXIV, 391 & 400 (1897); Hara in Bot. Mag. Tokyo LI, 839 (1937). *G. trifidum* var. *subbiflorum* Wiegand, l. c. 391 & 399 (1897). *G. subbiflorum* (Wiegand) Rydberg in Bull. Torr. Bot. Cl. XXXIII, 152 (1906). *G. Claytoni* var. *subbiflorum* (Wiegand) Wiegand in Rhodora XII, 229 (1910). *G. columbianum* Rydberg, Fl. Rocky Mts. 808 & 1066 (1917). *G. tinctorium* var. *subbiflorum* (Wiegand) Fernald in Rhodora XXXIX, 320 (1937). *G. trifidum* subsp. *columbianum* (Rydberg) Hultén, Fl. Aleut. 307 (1937).

Subsp. **tinctorium** (L.), comb. nov. *G. tinctorium* L. Sp. Pl. ed. 1, I, 106 (1753).—Fernald in Rhodora XXXVII, 445, pl. 403 fig 1–2 (1935). *G. Claytoni* Michaux, Fl. Bor.-Amer. I, 78 (1803); Wiegand, l. c. 400 (1897). *G. trifidum* β. *tinctorium* (L.) Torrey et Gray, Fl. N. Amer. II, p. 22 (1841).

4. Erigeron acris Group.—*Erigeron elongatus* Ledebour (1829), which has recently been applied to the plant with glabrescent involucres in N. America, Northern Asia and Northern Europe is not valid, as it has an earlier homonym, i. e. *E. elongatus* Moench (1802).

E. droebachensis was based on the plate 874 of Flora Danica and this binomial was validated for the first time by Retzius in Fl. Scand.

Prodr. ed. 2, p. 194, no. 1010 (1795). It may be identical with the plant in question, but most Scandinavian authors have rejected the name for the reason that they can not judge from its figure and its brief description whether it is the plant in question or is merely a form of *E. acris*, and the exact application of the name is quite doubtful.

The second name given to this group is *E. angulosus* Gaudin Fl. Helv. V, 265 (1829) described from the European Alps. The photograph of the type specimen in Herb. Inst. Bot. Univ. Lausanne in Switzerland is at my disposal through the courtesy of Prof. Maillefer and of Prof. Fernald to whom I express my sincerest thanks. Although *E. angulosus* has always narrow linear leaves, it agrees well with our plant in the hairiness on involucres and peduncles, the shape and size of involucral bracts, the length of pappus, etc. and I can not find any constant characteristics to separate the plants specifically. The common form in Eastern Asia and North America with broader leaves and sparsely hairy stems is without doubt identical with *E. kamtschaticus* DC., and should be considered as a variety of *E. angulosus*. This treatment, however, is only provisional, as the group of *E. acris* needs further critical study. When *E. acris* and *E. angulosus* are compared in their typical forms, they are quite distinct, but puzzling intermediate forms are sometimes found.

Erigeron angulosus Gaudin, Fl. Helv. V, p. 265 (1829); Koch, Synop. Fl. Germ. et Helv. ed. 1, p. 354 (1837). *E. droebachensis* b. *angulosus* (Gaudin) Reichenbach, Icon. Fl. Germ. et Helv. XVI, p. 11, t. 916-II (1854). *E. acris* β. *glabratus* Neilreich, Fl. Nied.-Oester. p. 331 (1859). *E. acris* forme I. *E. angulosus* Gaudin ex Rouy et Camus, Fl. Franc. VIII, p. 153 (1903). *Trimorpha angulosa* (Gaudin) Vierhapper in Beih. Bot. Centralbl. XIX-2, p. 423 (1906). *E. acris* subsp. *angulosus* (Gaudin) Vollmann, Fl. Bayern p. 725 (1914); Hegi, Fl. Mitt.-Europ. VI-1, p. 438 (1917).

Var. **kamtschaticus** (DC.), comb. nov. *Erigeron elongatus* Ledebour, Icon. Fl. Alt. I, p. 9, t. 31 (1829), Fl. Alt. IV, p. 91 (1833) and Fl. Ross. II, p. 487 (1845); DC., Prodr. V, p. 291 (1836); Fries, Novit. Fl. Suec. III, p. 108 (1842); Hartman, Handb. Scand. Fl. ed. 4, p. 270 (1843) and ed. 11, p. 9 (1870); Blytt, Norg. Fl. p. 563 (1861); Hultén, Fl. Kamt. IV, p. 160 (1930); Fernald in Rhodora XL, p. 346 (1938); not *E. elongatus* Moench, Method. Pl. Suppl. p. 247 (1802). *E. kamtschaticus* DC., Prodr. V, p. 290 (1836); Ledebour, Fl. Ross. II, p. 488 (1845); Koidzumi in Bot. Mag. Tokyo XXXI, p. 139 (1917); Komarov, Fl. Penin. Kamt. III, p. 126 (1930). *E. acris* var. *kamtschaticus* (DC.) Herder in Bull. Soc. Nat. Moscou XXXVIII-1, p. 392

(1865). *E. acris* ζ. *elongatus* (Ledeb.) Herder, l. c. *E. kamtschaticus* var. *hirsuta* Fr. Schmidt, Reis. Amur. u. Sachal. p. 147 (1868); Koidz. l. c. 140 (1917). *E. acer* var. *manshuricus* Komarov, Fl. Mansh. III, p. 610 (1907). *Trimorpha elongata* (Ledeb.) Vierhapper, l. c. p. 424 (1906); Lindman, Svensk Fanerog. p. 529 (1918). *E. acre* var. *hirsutum* (Fr. Schm.) Miyabe et Miyake, Fl. Saghal. p. 240 (1915); Hara in Bot. Mag. Tokyo LII, p. 70 (1938). *E. acris* (non L.) auct. Amer. et Japon; Kitamura, Comp. Jap. I, 324 (1937). *E. kamtschaticus* var. *manshuricus* Koidz., l. c. 140 (1917).

5. Anaphalis margaritacea.—Several forms have been described in this widely distributed species in North America and eastern Asia, but the relation between those forms has not been fully studied as yet. As pointed out by Profs. Fernald and Wiegand,[1] var. *occidentalis* Greene, with broad leaves shining green above, is regarded as the common form in the northern and western part of N. America and eastern Asia. Really the eastern Asiatic form agrees well with the western North American, although specimens from northeastern North America have somewhat larger heads and more obtuse involucral bracts. The oldest name for this variety is var. *intermedia* or *kamtschatica* Herder, which, however, should be considered as the typical form of the Linnean *Gnaphalium margaritaceum*, as Prof. Fernald[2] has recently cleared up the case.

A form with narrow green leaves about 5 mm. broad is called var. *angustior* (Miquel) Nakai in Japan, while it is called var. *revoluta* Suksdorf (= f. *anochlora* Fernald) in North America. Japanese specimens which are not uncommon in the middle part of Honshu have hardly any difference from the isotype of var. *revoluta* which I have examined. And the earliest varietal epithet for this form is *angustior*.

In January 1937, I published var. *intercedens*, which has narrow leaves lanate on both sides and occurs in gravelly places of northern Japan. To my surprise, it agrees well with var. *revoluta* f. *arachnoidea* Fernald which is common in eastern North America and had long been considered as the typical form of *A. margaritacea* (L.).

The above three varieties are often connected by intermediate forms; the distinction between var. *intermedia* and var. *angustior* especially is not clear in Japan. *Gnaphalium margaritaceum* α. *genuinum* or *americanum* Herder is a mixture of more than two varieties.

[1] Rhodora XIII, p. 26 & 27 (1911).
[2] Rhodora XL, p. 218 (1938).

Another form, var. *subalpina* Gray, is at present endemic in North America, and subsp. *japonica* (Schulz.-Bip.) Kitamura and subsp. *yedoensis* (Franch. et Sav.) Kitamura are endemic in Japan.

ANAPHALIS MARGARITACEA (L.) Bentham et Hooker fil., Gen. Pl. II, p. 303 (1873). *Gnaphalium margaritaceum* Linnaeus, Sp. Pl. ed. 1, II, p. 850 (1753).

Var. TYPICA. *Gnaphalium margaritaceum* β. *intermedium* s. *kamtschaticum* Herder in Bull. Soc. Imp. Nat. Moscou XL.-1, p. 415 (1867). *Anaphalis margaritacea* var. *occidentalis* Greene, Fl. Francis. IV, p. 399 (1897). *A. margaritacea* f. *latifolia* Kudo, Fl. Param. p. 165 (1922).

Var. ANGUSTIOR (Miquel) Nakai in Bot. Mag. Tokyo XL, p. 148 (1926). *Antennaria cinnamomea* DC. β. ? *angustior* Miquel, Ann. Mus. Bot. Lugd.-Bat. II, p. 178 (1866). *Anaphalis margaritacea* var. *revoluta* Suksdorf in All. Bot. Zeits. XII, p. 7 (1906). *Anaphalis margaritacea* f. *anochlora* Fernald in RHODORA XXIV, p. 205 (1922). *Anaphalis margaritacea* subsp. *angustior* (Miq.) Kitamura, Comp. Jap. I, p. 243 (Dec. 1937). *Anaphalis margaritacea* subsp. *angustior* (Miq.) Kitamura et Hara in Bot. Mag. Tokyo LII, p. 2 (Jan. 1938).

Var. INTERCEDENS Hara, l. c. p. 3 (Jan. 1938). *Anaphalis margaritacea* (non L.) Fernald et Wiegand in RHODORA XIII, p. 26 (1911). *A. margaritacea* var. *revoluta* f. *arachnoidea* Fernald in RHODORA XL, p. 219 (May 1938).

6. SAGINA MAXIMA.—*Sagina maxima* A. Gray has hitherto been applied to the common species in Japan and China which is characterized by having very minutely echinate seeds, and which is now called *S. japonica* (Sw.) Ohwi.[1] The examination of the type specimen of *S. maxima* preserved in the Gray Herbarium, however, proves that it is nothing but an elongate form of *S. litoralis* Hultén which is not uncommon in the coastal region of east Asia. The type specimen of *S. maxima* was collected by C. Wright at Hakodata in Hokkaido. In general appearance, it resembles *S. japonica;* its stems are rather slender, attaining 20 cm. long; its calyces also sparsely glandular-hairy. But its seeds have somewhat obscure flat rounded tubercles on the surface, and this last character clearly shows that the plant is not identical with *S. japonica.* As pointed out first by Prof. Nakai *S. litoralis* is closely allied to *S. crassicaulis* Watson, described from California, which has quite glabrous pedicels and calyces and nearly

[1] SAGINA JAPONICA (Sw.) Ohwi in Journ. Jap. Bot. XIII, 438 (1937). *S. procumbens* (non L.) Thunberg, Fl. Jap. p. 80 (1784). *Spergula japonica* Sw. ex Steudel, Nom. Bot. ed. 1, 802 (1821). *Spergella japonica* Sw. ex Steudel, l. c. ed. 2, II, 617 (1841). *Sagina sinensis* Hance in Journ. Bot. VI, 46 (1868). *Sagina maxima* (non A. Gray) auct. plur.; Nakai in Bot. Mag. Tokyo XXXVIII, [230] (1924); Steinberg in Fl. URSS. VI, 473, tab. XXV, fig. 8. (1936).

smooth seeds, although both plants, *S. litoralis* and *S. crassicaulis*, are found in northern Japan, in their typical form. I came to the conclusion, considering the occurrence of several intermediate forms, that *S. litoralis* should be regarded as a geographical variety of *S. crassicaulis* and made the combination *S. crassicaulis* var. *littorea* (Makino) for the former in Journal of Japanese Botany XIII, p. 556 (1937). But now, as *S. maxima* A. Gray antedates Watson's name by 24 years, I must change the combination as follows.

SAGINA MAXIMA A. Gray, Bot. Jap. p. 382 (1859) in adnota. *S. Linnaei* Presl var. *maxima* (A. Gray) Maximowicz in Bull. Acad. Imp. Sc. St. Pétersb. XVIII, p. 372 (1873) pro parte; Matsumura, Ind. Pl. Jap. II-2, p. 86 (1912) pro parte. *S. maxima* f. *littorea* Makino in Bot. Mag. Tokyo XXV, p. 156 (1911). *S. litoralis* Hultén, Fl. Kamt. II, p. 78, fig. 8 (1928) and IV, p. 248 (1930); Komarov, Fl. Penin. Kamt. II, p. 102 (1929); Steinberg in Fl. URSS. VI, p. 473, t. XXV, fig. 7 (1936); Hultén, Fl. Aleut. p. 169 (1937). *S. crassicaulis* var. *littorea* (Makino) Hara in Journ. Jap. Bot. XIII, p. 556 (1937).

Var. **crassicaulis** (Watson), comb. nov. *Sagina crassicaulis* Watson in Proc. Amer. Acad. XVIII, p. 191 (1883); Hultén, Fl. Aleut. p. 168 (1937); Hara, l. c. (1937).

II. THE CRUCIFEROUS GENUS PHYSARIA

REED C. ROLLINS[1]

(Plate 556)

THE Cruciferae are highly developed in western North America both as to the number of biological entities present and the extent of their divergence from any single morphological pattern. A number of genera, including *Physaria*, are unique in being wholly confined to this area and in that they are apparently of comparatively recent origin. These features together with the fact that *Physaria* has never been intensively examined make a study of certain aspects of its ecology, cytology, morphology, speciation and the relationships of its species seem highly desirable. With these points in mind, an investigation of the genus was undertaken involving detailed observations in the field and in the laboratory. The results are presented in the paragraphs that follow.

Physaria occurs in the Upper Sonoran, Transition, Montane and lower Canadian life-zones, chiefly on high plateaus and lower moun-

[1] Society of Fellows of Harvard University.

tain elevations, from the great plains to the Cascades and Sierra Nevada and from Canada to Arizona and New Mexico. In general the habitat is of a dry barren sort, where sunlight is intense and competition between plant species and individuals often approaches a minimum, but where survival entails special adaptation. The xeric conditions under which the plants survive is reflected in the abundant, often densely encrusted vestiture found upon them. Though the Cruciferae have long been famous for the lime-preference which its members show, *Physaria*, as is true of several other genera in the family, seems to be somewhat less selective. This is particularly true of certain species. The plants often occupy siliceous soils of a loose nature or are equally at home on heavily lime-impregnated shale outcrops.

The natural relationship between *Physaria* and *Lesquerella* is very marked. These two genera have almost exactly the same floral pattern, habit of growth and vestiture, which is of a distinctive sort. The siliques too are very similar. In fact the two are not easily recognized as distinct genera if only flowering plants are considered. The fruit of *Physaria* is always didymous, markedly constricted at the replum and usually highly inflated, while that of *Lesquerella* is unconstricted at the replum, never didymous and much less inflated. But even in these respects certain species of *Lesquerella*, namely *L. Kingii* and its close relatives, approach the condition found in such species of *Physaria* as *P. Geyeri*. This relationship was pointed out by Payson,[1] but was disregarded or overlooked by O. E. Schulz[2] who recently placed the two genera in widely separated tribes of the family. The cytological evidence also indicates a closer relationship than that attributed to them by Schulz. On the other hand there is no question as to the separateness of these two genera.

Three species of *Physaria* have been investigated cytologically, the chromosome number having been found to be N = 4 in each case (text figs. 1 & 2). These counts, the first for the genus, were made from aceto-carmine smears of developing pollen. Buds from wild plants were killed and fixed in alcohol-acetic in the field at the following localities: *P. acutifolia* Rydb., N = 4, dry hillsides, granitic talus, 5 mi. east of Parlin, Gunnison Co., Colo., May 21, 1938, *Rollins 2088* (G, R); *P. floribunda* Rydb., N = 4, dry rocky hillside, 3 mi. east of

[1] Ann. Mo. Bot. Gard. **8**: 129 (1921).
[2] Natur. Pflanzenfam. **17***b* (1936).

Sapinero, Gunnison Co., Colo., May 23, 1938, *Rollins 2108* (G, R); *P. australis* (Pays.) Rollins, N = 4, limy knoll, 3 mi. west of Fort Bridger, Uinta Co., Wyoming, *Rollins 2229* (G, R). If these results may be taken as indicative, then the basic or fundamental number for *Physaria* must be four.

It has been suggested by Payson (*l. c.*) that *Physaria* was derived from *Lesquerella*. His suggestion was based chiefly on morphological studies, but is equally supported by the present cytological observations on both genera. Chromosome numbers of 2N = 10, 18 and 12 have been reported for *Lesquerella* by Manton.[1] I have found N = 5 for four species, N = 6 for one species and N = 8 for another species

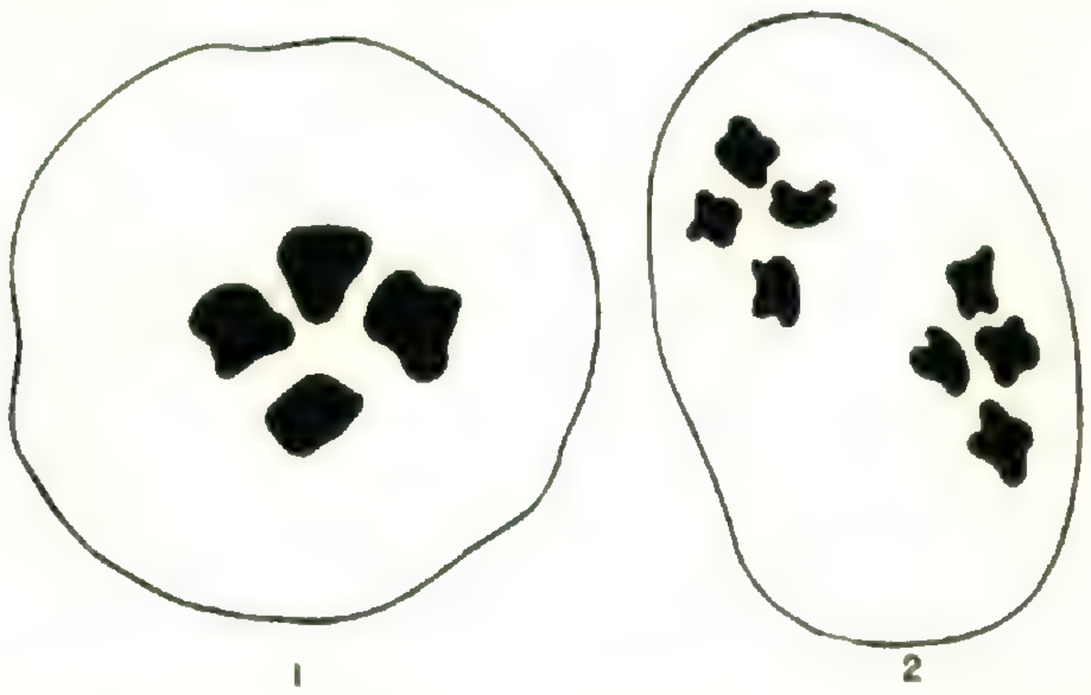


FIG. 1. Chromosomes in a developing pollen grain of PHYSARIA FLORIBUNDA Rydb. *Rollins* no. 2108. × about 1000.
FIG. 2. Chromosomes in a dividing pollen mother cell of P. ACUTIFOLIA Rydb. *Rollins* no. 2088. × about 1000.

of the same genus. N = 5 and 6 coincide with the findings of Manton, but the discovery of N = 8 further indicates a probable aneuploid relationship between species of the genus. A cytological study of *Lesquerella* has not proceeded far enough for the accurate determination of its basic chromosome number, but since N = 5 is lowest and most commonly found, in all probability, it represents one of the fundamental numbers for the genus. If this is true, then the case of *Physaria* and *Lesquerella* may be added as a further example of the aneuploid relationship between genera of the Cruciferae so lucidly described by Manton. In any case it seems probable that the loss of a single chromosome from the compliment of five found in certain members of Eu-Læsquerella has been of major importance in the genesis of *Physaria*.

Several inter-related groups of species are found in *Physaria*, but

[1] Ann. Bot. **46**: 531 (1932).

none are sufficiently distinct and definable to make necessary or desirable a subdivision of the genus. In fact each is connected with another through a continuous chain of intermediate species. Probably the most natural aggregation is that made up of *P. Geyeri*, *P. oregona*, *P. alpestris* and *P. Newberryi*. Of these, the former two species show a closer relationship between one another than with either of the latter two. The following may be noted as characteristics commonly shared by members of this group: shallow apical sinus, ovate to ovate-lanceolate replum with an acute apical angle, valves compressed opposite the replum-axis and the lack of a basal sinus. The ovule-number ranges from 2 to 6 in each loculus of the silique among members of this group. There is apparently a straightforward evolutionary trend expressed among these species which becomes increasingly evident when the structural relationships of the fruits are thoughtfully considered. The most striking changes have apparently accompanied a reduction in the number of ovules. These include a progressive sterilization of ovuliferous tissue along the outer margins of the replum. This tissue when relieved of its ovule-bearing function appears to have been converted into tissue of the style. The result has been a shortening of the replum and an increase in the length of the style. If one attempts to arrange the species of this group in a probable evolutionary sequence, invariably *P. oregona* comes out as the most primitive. From the primitive stock, *P. Geyeri* and *P. alpestris* appear to be direct descendants. The genesis of *P. Newberryi* may be the same, but the relationship here is not quite so evident. *P. Chambersii* seems to be transitionary toward other members of the genus. Its silique has certain features in common with *P. alpestris*, but the replum resembles that of *P. floribunda*.

Another natural grouping includes *P. didymocarpa*, *P. condensata* and *P. australis*. Here as in the above we see a progressive reduction in ovule-number, lengthening of style and shortening of replum which results in a greater constriction between the valves. Several types of divergence from the primitive *P. didymocarpa* are notable. *P. condensata* shows the extreme in reduction of growth-form and must surely be a derived species. Another divergence is found in *P. didymocarpa* var. *lanata* in which the entire body of the plants is invested in the same loose pubescence characteristic of only the silique in the species proper. The number of ovules in each ovary-loculus has been reduced to two and the replum has become exceedingly short and

constricted in *P. australis*. This species appears to be the natural link to the third group of inter-related species to which *P. vitulifera, P. Osterhoutii, P. brassicoides, P. acutifolia, P. floribunda* and *P. Grahamii* belong. These species all possess moderately inflated siliques and the ovule-number is uniformly two for each loculus of the ovary. No very marked evolutionary trends are evident, hence any attempt to arrange the species according to the probable order of their origin would be little short of pure speculation. However, certain of the species are more closely related than others. For example, *P. vitulifera* and *P. Osterhoutii* are obviously closely inter-related as are also *P. floribunda* and *P. acutifolia*.

All the known species of *Physaria* are perennial and possess a relatively large central tap-root. The plants are caespitose, with herbaceous flowering stems arising laterally on an elongated woody, usually simple caudex. The basal leaves are borne along the caudex and subtend the flowering stems. These leaves invariably form a sterile rosette on the terminal portion of the caudex or caudex-branch, imparting a characteristic symmetry to the plants as they are observed in their native habitats. This rosette-habit is found in its extreme form in *P. condensata*, where most of the plant is simply "rosette." The shape, size and degree of toothing of the leaves varies between species, but there is a certain amount of stability on these features within any given entity. There is a tendency for the leaves to be entire, or at most remotely dentate, in most species of the genus. However, certain species have the basal leaves dissected.

The flower-parts are reasonably uniform throughout the genus and offer little of diagnostic value in distinguishing between species. The sepals are recognizable as two pairs, one being broader than the other. They are always pubescent with the same type of indument which is found on the rest of the plant. The petals are glabrous, entire, yellow and nearly spatulate. There is little differentiation between blade and claw, but the two pairs of petals differ in width. Characters of the fruit are highly important in indicating relationships and are extremely useful in the delimitation of natural entities. This point was adequately emphasized by Robinson[1] who said of *Physaria*, "species with excellent characters in the fruit, but otherwise very difficult to distinguish." The siliques are pubescent, didymous, variously shaped and possess a sinus at both base and apex or at apex only. The replum

[1] Syn. Fl. 1: 121 (1895).

is an important diagnostic character which has previously been almost entirely overlooked. Shape, apical angle and dimensions are all important considerations. The number of ovules in each loculus of the silique is a constant feature of several species. This constancy seems to be correlated with a reduced number. Abortion is so common in *Physaria* that it is the normal condition. Species with four or more ovules in each loculus normally develop two or three seeds and species with two ovules in each loculus usually develop only a single seed. The style is persistent and varies in length, but within limits the style is a useful character for distinguishing certain species.

The seeds are wingless and fairly uniform throughout the genus, differing only in dimensions. Within the seeds, the cotyledons are consistently accumbent. The indument varies only slightly, being always of the many-rayed stellate type. The rays are nearly always forked, but vary in length and the degree to which they are appressed to the plant-surface. In *P. Grahamii* and *P. didymocarpa* var. *lanata* the stellae are sufficiently long and spreading to give a lanate appearance to the plants. Uniform in type, covering the entire mature plants and nearly always giving them a silvery appearance, the vestiture cannot be considered of major importance in specific delimitation as is the case in many genera of the Cruciferae. Plants of *Physaria* have been grown in a greenhouse where observations were made on their ontogenetic development. In a young plant the cotyledons are perfectly glabrous, strikingly in contrast with the first pair of true leaves which are heavily incrusted with stellae. In general habit plants grown under artificial conditions differ in no marked way from those which one observes in nature.

Nuttall is credited with the recognition of *Physaria* as a distinct entity by his having been listed as the author of section *Physaria* of the genus *Vesicaria* by Torrey and Gray.[1] After the publication of a second species in the group by Hooker,[2] Gray[3] realized that the plants belonged to a different genus and accordingly raised section *Physaria* to generic rank and at the same time transferred *Vesicaria didymocarpa* and *V. Geyeri* to it. The generic status of *Physaria* as a biological category has never been questioned by subsequent workers. O. Kuntze[4] substituted the name *Coulterina* for *Physaria*, contending

[1] Fl. North Am. **1**: 102 (1838).
[2] Lond. Journ. Bot. **6**: 70 (1847).
[3] Gen. Illustr. **1**: 162 (1848).
[4] Revis. Gen. **2**: 931 (1891).

that the fungus genus *Physarium* preoccupied the name. However, no such interpretation is possible under specific provisions of the International Rules of Botanical Nomenclature. *Physaria* has been studied in parts by the writers of manuals on the botany of western America, but the nearest approach to an inclusive treatment of the genus is that of Payson,[1] in which a key and notes on the distribution of the species are presented.

It is a pleasure to acknowledge unreserved cooperation from the following public or private herbaria in connection with this study: Clokey Herbarium (Cl); Gray Herbarium (G); New York Botanical Garden (NY); North Dakota Agricultural College (NDA); Rocky Mountain Herbarium (RM); United States National Herbarium (US). Collections bearing the symbol (R) are in my own herbarium.

Synopsis of the Genus Physaria (Nutt.) Gray

Perennial, caespitose, silvery stellate; stems simple, arising laterally on a somewhat elongated caudex; basal leaves usually numerous, often terminating the caudex or its branches in rosette, form, petiolate, oblanceolate to obovate or the blade rotund, entire, dentate or divided into segments; cauline leaves present, usually few, entire or dentate; inflorescence congested to somewhat elongated, usually elongating in fruit; pedicels rigid; sepals linear-oblong, pubescent, often cucullate at apex; petals yellow or rarely purplish, usually spatulate, glabrous; siliques didymous, pubescent, often highly inflated, apical sinus present; ovules 2–6 in each loculus; style persistent; seeds brown, wingless.—Gray, Gen. Illustr. **1**: 162 (1848); Coulter, Man. Rky. Mt. Region 26 (1885); Prantl in Engler & Prantl, Nat. Pflanzenfam. **3**: 187 (1891); Robinson in Gray, Syn. Fl. N. Am. **1**: 121 (1895); Howell, Fl. Northw. Am. **1**. 52 (1897); Britt. & Brown, Ill. Fl. **2**: 135 (1897); Heller, Cat. N. Am. Pl. 88 (1900); Rydb., Fl. Colo. 154 (1906); Coulter & Nelson, Man. Cent. Rky. Mts. 217 (1909); Hayek in Beih. Bot. Centr. **27**: 311 (1911); Frye & Rigg, Northw. Fl. 186 (1912); Piper & Beattie, Fl. Se. Wash. and Adj. Ida. 121 (1914); Clements & Clements, Rky. Mt. Fls. 25 (1914); Wooton & Standley in Contrib. U. S. Nat. Herb. **19**: 270 (1915); Rydb., Fl. Rky. Mts. Adj. Pl. 330 (1917); Payson in Ann. Mo. Bot. Gard. **5**: 143 (1918); Tidestrom in Contrib. U. S. Nat. Herb. **25**: 233 (1925); Rydb., Fl. Pr. Pl. Centr. N. Am. 362 (1932); Munz, Man. So. Calif. Bot. 197 (1935); St. John, Fl. Se. Wash. Adj. Ida. 175 (1937). *Coulterina* O. Kuntze, Revis. Gen. **2**: 931 (1891). *Vesicaria*, sect. *Physaria* Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 102. (1838). Type species: *P. didymocarpa* (Hook.) Gray.

[1] Ann. Mo. Bot. Gard. **5**: 143–147 (1918).

Artificial Key to the Species

a. Style less than 3.5 mm. long (usually 1–2 mm.); replum lanceolate; basal sinus absent....*b.*
  b. Valves of silique slightly inflated, flattened contrary to replum, not keeled; apical sinus and sinus-shoulders rounded.....1. *P. oregona.*
  b. Valves of silique highly inflated, strongly keeled on margins; apical sinus and sinus-shoulders acute.....4. *P. Newberryi.*
a. Style more than 4 mm. long; replum various, but lanceolate only in *P. alpestris;* basal sinus present or absent....*c.*
  c. Apical sinus of silique shallow (less than 1 mm.); apical angle of replum acute (except in *P. Geyeri* var. *purpurea*)....*d.*
    d. Silique slightly inflated, cordate in outline, less than 1 cm. wide; ovules 2 in each loculus (sometimes 3 in var. *purpurea*).....2. *P. Geyeri.*
    d. Silique highly inflated, orbicular in outline, more than 1 cm. wide; replum lanceolate; ovules about 4 in each loculus.....3. *P. alpestris.*
  c. Apical sinus of silique deep (more than 2 mm.); apical angle of replum obtuse....*e.*
    e. Replum obovate; ovules 4 in each loculus of silique....*f.*
      f. Basal leaves 5–15 mm. long; plants densely tufted; stems less than 1 cm. long.....7. *P. condensata.*
      f. Basal leaves 15–40 mm. long; plants loosely tufted; stems about 1 dm. long.....6. *P. didymocarpa.*
    e. Replum narrowly oblong to linear-oblong (broader in *P. acutifolia* but there are only two ovules in each loculus in this species); ovules 2–6 in each loculus of silique....*g.*
      g. Sinuses of silique equal above and below; valves nearly orbicular.....8. *P. australis.*
      g. Sinuses of silique unequal (upper very deep, lower shallow or absent); valves variously shaped but not orbicular....*h.*
        h. Silique highly inflated, 1.5–3 cm. wide; valves membranaceous.....5. *P. Chambersii.*
        h. Silique moderately inflated, less than 1.5 cm. wide; valves coriaceous....*i.*
          i. Plants loosely pubescent (almost lanate); cauline leaves dentate.....9. *P. Grahamii.*
          i. Plants closely appressed-pubescent; cauline leaves entire....*j.*
            j. Basal leaves rounded at apex; apical sinus of silique broad and deep (equaling replum-length in width and depth)....*k.*
              k. Silique cordate, acute at base; basal leaves large (about 2 cm. broad).....10. *P. brassicoides.*
              k. Siliques rectangular in outline, obtuse or truncate at base; basal leaves smaller (about 1 cm. broad).....11. *P. vitulifera.*
            j. Basal leaves acute at apex; apical sinus of silique shallow or narrow and deep....*l.*
              l. Apical sinus of silique narrow (less than 1 mm.) and deep (equaling replum-length); basal sinus absent; siliques pendant, loosely stellate.....12. *P. Osterhoutii.*
              l. Apical sinus of silique broad (more than 2 mm.); basal sinus usually present but very

shallow; siliques erect or pendant, appressed-pubescent . . . . *m.*

m. Basal leaves entire or with a single broad tooth on each side, linear-oblanceolate, less than 4 cm. long; replum narrowly obovate . . . . . 13. *P. acutifolia.*

m. Basal leaves divided, broadly oblanceolate, more than 4 cm. long; replum linear, constricted . . . . . 14. *P. floribunda.*

1. P. OREGONA Watson. Perennial, caespitose, silvery stellate-pubescent throughout; caudex simple; stems several to numerous, erect or somewhat decumbent, simple, 1–3.5 dm. long including the fruiting raceme; basal leaves obovate, slender-petioled, usually incised or with a few broad teeth along the petiole, 4–6 cm. long, 8–15 mm. broad; cauline oblanceolate or broader, entire or sparsely dentate, acute, 1.5–2.5 cm. long, 3–5 mm. wide; sepals pubescent, oblong, 5–7 mm. long, about 1 mm. wide; petals lemon-yellow, spatulate, 9–12 mm. long, 2–3 mm. wide; fruiting pedicels spreading, curved upward, 1–2 cm. long; fruiting raceme 5–15 cm. long; siliques didymous, loosely pubescent with spreading stellae, inflated but not exceedingly so, flattened laterally, obreniform, 1.8–2.5 cm. broad, 10–12 mm. long; apical sinus broad and open, basal sinus lacking; replum broadly lanceolate, acute at apex, 6–8 mm. long, 2–3 mm. wide; style 1–2 mm. long; ovules 4 on each side of replum; seeds orbicular, brown, 2–3 mm. broad, 2–3 in each loculus, marginless.—Proc. Am. Acad. Arts & Sci. **17**: 363 (1882); Robinson in Gray, Syn. Fl. **1**: 121 (1895); Howell, Fl. Northw. Am. **1**: 52 (1897); Frye & Rigg, Northw. Fl. 186 (1912); Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918); St. John, Fl. Se. Wash. Adj. Ida. 175 (1937). *Coulterina oregona* O. Kuntze, Revis. Gen. **2**: 931 (1891).—Western Idaho and eastern Oregon. IDAHO: Sheep Creek, Snake River Canyon, Idaho Co., April, 1935, *Constance & Rollins 1029* (NY); May, 1937, *Constance, Hedrick & Peters 1822* (G, R). OREGON: Pine Creek, Baker Co., June 23, 1880, *Cusick* (G TYPE, US ISOTYPE); April, 1881, *Cusick* (G); 1886, *Cusick* (G, US); hillsides near Snake River, May 25, 1898, *Cusick 1895* (G, US); near Imnaha, Wallowa Co., July, 1933, *Peck 17500* (NY); Cache Creek, Wallowa Co., May, 1897, *Sheldon 8183* (G, NY, US).

The outstanding distinctive characteristics of *P. oregona* are found in the silique, which is flattened contrary to the replum and only slightly inflated laterally. In these respects the species is similar to *P. Geyeri* and differs from other members of the genus. The larger silique and shorter style easily differentiate it from the latter species. *P. oregona* is an endemic of the Snake River Canyon region of Oregon and Idaho and is of interest because of its restriction to this unique area.[1]

[1] See Constance & Rollins, Proc. Biol Soc. Wash. **49**: 147 (1936).

2. P. Geyeri (Hook.) Gray, var. **typica.** Perennial, caespitose, silvery stellate-pubescent throughout; caudex usually simple; stems numerous, decumbent, simple, arising laterally, 1–3 dm. long including the fruiting raceme; basal leaves numerous, obovate, slender-petioled, entire or rarely with a few broad teeth along the petiole, 3–7 cm. long, 8–12 mm. broad; cauline entire, oblanceolate, 1.5–3 cm. long, 3–5 mm. wide; sepals oblong, pubescent with spreading stellae, 5–7 mm. long, 1–2 mm. wide; petals yellow, spatulate, 8–12 mm. long, 3–4 mm. wide; pedicels spreading, slightly curved upward or sigmoid, 1–2 cm. long; siliques didymous, inflated but not exceedingly so, obcordate, apical sinus broad and open, basal sinus absent, loosely pubescent with spreading stellae, flattened laterally, 6–9 mm. broad, 5–7 mm. long; replum ovate, apical angle acute, 4–6 mm. long, 2–3 mm. broad; style 5–7 mm. long; ovules 2 in each loculus; seeds brown, marginless, 1 or 2 in each loculus, about 2 mm. broad.—*P. Geyeri* (Hook.) Gray, Gen. Illustr. **1**: 162 (1848); Robinson in Gray, Syn. Fl. **1**: 121 (1895); Howell, Fl. Northw. Am. **1**: 52 (1897); Frye & Rigg, Northw. Fl. 186 (1912); Piper & Beattie, Fl. Se. Wash. Adj. Ida. 122 (1914); Rydb., Fl. Rky. Mts. Adj. Pl. 331 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918); St. John, Fl. Se. Wash. Adj. Ida. 175 (1937). *Vesicaria Geyeri* Hook., Lond. Journ. Bot. **6**: 70 (1847). *Coultcrina Geyeri* O. Kuntze, Revis. Gen. **2**: 931 (1891).—Eastern Washington to western Montana. Montana: Jefferson Co., July, 1892, *F. D. Kelsey* (NY); Deer Lodge Valley, June, 1906, *M. E. Jones* (US); Madison Co., June, 1888, *F. Tweedy* (NY); Miller Creek, Missoula Co., May, 1926, *Kirkwood 2414* (G). Idaho: shore of Lake Coeur d'Alene, Kootenai Co., July, 1895, *Leiberg 1314* (G, NY). Washington: Spokane Valley, *Geyer 476* (G isotype); Spokane River, Spokane Co., May, 1937, *Constance 1834* (G, R); June 1893, *Henderson 2384* (G); May, 1924, *St. John 7632* (G, NY); May, 1896, *Piper 2293* (G, NY); Hangman Cr., Spokane Co., May, 1893, *Sandberg & Leiberg 17* (G, NY); between Spokane River and Colville, Wilkes U. S. Explor. Exp. *435* (NY); Davenport, Lincoln Co., May 20, 1905, *M. E. Jones* (US).

The specific nature of this entity has not been questioned since its original publication by Hooker. As pointed out above, its natural relative is *P. oregona* from which it is amply distinct. *P. Geyeri* has a restricted geographical range and is apparently common in the Spokane Valley of eastern Washington where it was first discovered.

Var. **purpurea,** var. nov. Petals purple; apical angle of replum obtuse; ovules often 3 in each loculus of the silique.—Planta perennis; petalis purpureis; replo obovato basi apicique obtuso; loculis circa 3-ovulatis.—Idaho: Bonanza, Custer Co., July 25, 1916, *Macbride & Payson 3448* (G type, NY isotype); Challis Creek, Custer Co., July 1916, *Macbride & Payson 3342* (G, NY).

3. P. alpestris Suksdorf. Perennial, caespitose, silvery stellate-pu-

bescent throughout; caudex simple or rarely branched, stems several, simple, arising laterally, erect or somewhat decumbent, 5–15 cm. long including fruiting raceme; basal leaves numerous, entire, obovate, rarely acutish, tapering abruptly to a slender petiole, 3–5 cm. long, 1–2 cm. broad; cauline oblanceolate, few, 5–15 mm. long, 3–5 mm. broad; inflorescence subcorymbose; sepals oblong, pubescent, 8–10 mm. long, 1.5–2 mm. broad; petals yellow, spatulate, undifferentiated into blade and claw, 12–14 mm. long, 2–3 mm. broad; ovary incrusted with stellae; fruiting pedicels divaricate, straight, 5–10 mm. long; siliques didymous, highly inflated, with a shallow open sinus above, slightly notched below, evenly pubescent; valves subreniform, 1–1.5 cm. long, 7–10 mm. wide; replum lanceolate, acutely angled at apex, 7–10 mm. long, 1.5–2.5 mm. broad; style 5–7 mm. long; ovules 4–5 in each loculus; seeds brown, suborbicular, flattened, 2–3 mm. broad, 1–3 in each loculus.—West Am. Sci. **15**: 58 (1906); Payson in Ann. Mo. Bot. Gard. **5**: 147 (1918); G. N. Jones in Univ. Wash. Publ. **7**: 91 (1938). *P. didymocarpa* Howell, Fl. Northw. Am. **1**: 52 (1897) in part; Frye & Rigg, Northw. Fl. 186 (1912).—West-central Washington. Washington: locality uncertain, Wilkes U. S. Expl. Exp. *888* (NY, US); Mt. Stuart region, Chelan Co., Aug., 1930, *Thompson 5813* (G); Tronson Ridge, Chelan Co., June, 1932, *Thompson 8595* (G, NY); June, 1933, *Thompson 8966* (G, NY); Three Brothers, Chelan Co., June, 1934, *Thompson 10540* (NY); Beverly Creek, Kittitas Co., July, 1932, *Thompson 8708* (G, NY); near Liberty, Kittitas Co., June, 1935, *Thompson 11578* (G, NY); Mount Paddo (Adams), July 12, Sept. 2, 1900, *Suksdorf 2648* (G, NY isotypes); Aug. 30, 1904 and July 27, 1906, *Suksdorf 4137* (G).

P. alpestris has been critically discussed elsewhere. It stands well apart as a species both on morphological and geographical grounds. The nearest relative from a technical standpoint appears to be *P. oregona*, but the species is also related to *P. Chambersii* on account of the large highly inflated fruits and orbicular entire basal leaves. However, the replums of the two are decidedly different and it seems probable that their ancestory was entirely different.

4. P. Newberryi Gray. Perennial, caespitose, silvery-stellate throughout; caudex simple or branched; stems several to numerous, erect, simple, arising laterally, 0.5–1 dm. long including the fruiting raceme; basal leaves obovate, incised or merely dentate with broad teeth, slender-petioled, 4–8 cm. long, 1.5–2.5 cm. broad; cauline few, entire, oblanceolate, 1–2 cm. long, 3–4 mm. wide; sepals linear-oblong, pubescent, 7–9 mm. long, about 1 mm. wide; petals yellow, ligulate, often truncate at apex, 10–13 mm. long, 2–3 mm. wide; fruiting raceme dense, 3–5 cm. long; pedicels rigid, straight, divaricate, 5–10 mm. long; siliques didymous, highly inflated, apical sinus broad the shoulders angular, evenly covered with appressed stellae; valves

keeled on both outer margins, each valve 8–12 mm. wide, 12–16 mm. long; replum linear, acute at apex, 8–10 mm. long, 1–1.5 mm. wide; style 2–3 mm. long; ovules 2–4 in each loculus; seeds obovate, light brown, marginless, 2–3 mm. wide, 3–4 mm. long.—Ives' Report Colo. River, pt. 4. 6 (1860); Robinson in Gray, Syn. Fl. **1**: 121(1895) in part; Coulter & Nelson, Man. Cent. Rky. Mts. 218 (1909) in part; Wooton & Standley in Contrib. U. S. Nat. Herb. **19**. 270 (1915); Rydb., Fl. Rky. Mts. Adj. Plains 331 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918). *P. didymocarpa* var. *Newberryi* Jones in Proc. Calif. Acad. Sci. **2**: 5. 624 (1895) in part. *Coulterina Newberryi* O. Kuntze, Revis. Gen. **2**: 931 (1891).—New Mexico to northern Arizona. NEW MEXICO: locality uncertain, western New Mexico, May, 1869, *E. Palmer* (G, NY, US); near Tegua, May 14, 1858, *J. S. Newberry* (G TYPE, NY, US ISOTYPES); Fort Wingate, 1882 & 1883, *W. Mathews* (G); May 27, 1883, *C. D. Walcott 43* (US); Gallup, June 14, 1916, *Eastwood 5595* (G, US). ARIZONA: Cave Dwellers Mt., east of Mt. Agassiz, Aug., 1884, *Lemmon 3356* (G); Sunset Peak, Flagstaff, June, 1928, *Osterhout 7000* (RM); July, 1923, *H. C. Hansen 620* (RM); July, 1937, *R. E. Collom 746* (US); May–Oct., 1900, *Purpus 7075* (US); July, 1901, *Leiberg 5699* (US); 15 miles no. of Granado, Apache Co., June, 1937, *Peebles & Smith 13478* (US); San Francisco Mts., June, 1887, *E. A. Mearns* (NY); near Flagstaff, June, 1891, *McDougal 154* (US).

Physaria Newberryi is one of the most distinctive species of the genus and it is, therefore, difficult to understand why confusion over its relationship to other members has been so general. It would seem from the identifications on many specimens that any plant with highly inflated siliques, regardless of other characteristics, has been considered to be good *P. Newberryi*. Actually the V-shaped apical sinus, short style and straight-sided siliques are distinctive characteristics which well define this species.

5. P. **Chambersii**, sp. nov. Herba perennis caespitosa undique indumento argenteo-stellato tecta; caulibus decumbentibus vel erectis 5–15 cm. longis; foliis radicalibus obovatis vel rotundatis integris vel dentatis 3–6 cm. longis, 1–2 cm. latis; foliis caulinis integris spathulatis acutis 1–2 cm. longis, 3–6 mm. latis; inflorescentiis laxis; sepalis lineari-oblongis 6–8 mm. longis, 1 mm. latis; petalis flavis spathulatis 10–12 mm. longis, 3–4 mm. latis; pedicellis fructiferis divaricatis 8–15 mm. longis; siliquis didymis inflatis pubescentibus; loculis subreniformibus 1–1.5 cm. longis, ca. 1 cm. latis; replo oblongo 4–6 mm. longo, 1 mm. lato; stylo 6–8 mm. longo; loculis di- vel hexispermis; seminibus exalatis.

Perennial, caespitose, silvery stellate throughout; stems numerous from a simple caudex, arising laterally, erect or very often decumbent, simple, 5–15 cm. long including the fruiting raceme; radical leaves

entire or dentate, obovate to orbicular, slender-petioled, 3–6 cm. long, 1–2 cm. broad; cauline few, entire, spatulate, often acute, 1–2 cm. long, 3–6 mm. wide; inflorescence rather lax; sepals linear-oblong, pubescent, 6–8 mm. long, 1 mm. wide; petals yellow, spatulate, 10–12 mm. long, 3–4 mm. wide; fruiting raceme congested, 2–10 cm. long; pedicels divaricate, slightly sigmoid, 8–15 mm. long; siliques didymous, greatly inflated, evenly and often densely pubescent, often purplish at maturity, obtuse to slightly cordate at base; apical sinus deep and open, crests rounded; valves subreniform, each valve 1–1.5 cm. long, about 1 cm. wide; replum oblong, obtuse at apex, 4–6 mm. long, 1 mm. wide; style 6–8 mm. long; ovules 2–6 (mostly 4) on each side of the replum; seeds orbicular, flattened, brown, 2–3 mm. broad, 2–4 in each loculus, marginless.—*P. didymocarpa* Howell, Fl. Northw. Am. **1**: 52 (1897) in part. *P. Newberryi* Rydb., Fl. Rky. Mts. Adj. Pl. 331 (1917) in part; Tidestrom in Contrib. U. S. Nat. Herb. **25**: 233 (1925) in part; Munz, Man. So. Calif. Bot. 198 (1935).—Utah and Nevada. UTAH: Pahvant Butte, Millard Co?, May, 1925, *A. J. Harris C2518* (G); southern Utah, 1877, *E. Palmer 34* (NY, US); Thistle Junction, June, 1900, *S. G. Stokes* (NY, US); Cedar City, May, 1894, *M. E. Jones 5202* (NY, US); Marysvale, June, 1894, *M. E. Jones 5397c* (NY, US); Ephraim, San Pete Co., May, 1914, *Eggleston 10111* (US); Mt. Nebo, Juab Co., Aug., 1905, *Rydberg & Carleton 7701* (NY); Parley's Canyon, Salt Lake Co., June, 1923, *Garrett 3031* (G). NEVADA: Clover Mts., July, 1893, *E. L. Greene* (NY); Santa Rosa Mts., Humboldt Co., July, 1898, *Cusick 2025* (G, US); Lamoille Canyon, Ruby Mts., Elko Co., July, 1938, *Rollins & Chambers 2568* (G, R); Aug., 1908, *Heller 9378* (NY, US); 36 mi. w. of Wendover, Elko Co., June, 1934, *Maguire 5808* (G); 20 mi. sw. of Jiggs, Eureka Co., July, 1938, *Rollins & Chambers 2543* (G, R); mountain slopes of Jet Canyon, 15 mi. west of Round Mountain, Toiyabe Mts., Nye Co., July, 1938, *Rollins & Chambers 2502* (G TYPE, R ISOTYPE); Bunker Hill, Toiyabe Forest, July, 1913, *A. E. Hitchcock 860* (US); Trail Canyon, White Mts., Esmeralda Co., July, 1932, *Duran 3349* (G, NY); Mt. Gabb, Palmetto Range, 1898, *Purpus 5863* (US); Karshaw, Lincoln Co., May, 1902, *Goodding 973* (G, NY); Kyle Canyon, Charleston Mts., July, 1936, *Clokey 7102* (R, Cl); Clark Canyon, Charleston Mts., May, 1936, *Clokey & Anderson 7099* (R, Cl); Cold Cr., Charleston Mts., June, 1938, *Clokey 7946* (Cl). OREGON: Sheaville, Malheur Co., June, *Percy Train* (US) (This is a flowering specimen which is provisionally placed here. Certainly it is not *P. oregona* Wats. as determined by the collector).

Physaria Chambersii is somewhat related to *P. Newberryi* and has been confused with it by several botanists. The technical characters of the two species show that the relationship is not a particularly close one. Both have a broad open sinus at the base of the style and the siliques are large and highly inflated, but here similarity of silique-

characteristics cease. The siliques of *P. Newberryi* have keeled apical margins, truncate base, sinus-crests decidedly angular, style 2–3 mm. long, replum 8–10 mm. long with acute apex and straight-sided valves, whereas in *P. Chambersii* the siliques have rounded sides and apical margins, cordate or nearly truncate base, sinus-crests rounded, style 8–13 mm. long and replum 3–6 mm. long with an obtuse apex. Actually, *P. Chambersii* has a closer relative in *P. australis*. The latter has much smaller coriaceous siliques with closed sinuses of equal depth, whereas *P. Chambersii* has large chartaceous siliques with a deep open apical sinus and a basal sinus which is very shallow or entirely absent. The two species occupy different geographical areas as well.

Variation in the number of ovules in different collections of *P. Chambersii* is puzzling. The ovule-number is consistent for any given collection, but accompanying significant morphological changes apparently have not taken place. Thus, it is possible to find among the collections which are considered to belong to this species a number which have only two ovules in each loculus, a number with four and a few with six. I have not found any variation in number in different siliques from the same plant nor from different plants of the same collection. It would seem from this that a reduction in ovule-number may be independent of other changes in the plant and having once occurred it tends to become fixed or constant. If this is of survival value to the plant, it might be reasonably supposed to be of importance in the origin of new biologically natural entities in the genus.

Var. **membranacea**, var. nov. Herba perennis caespitosa; foliis radicalibus oblanceolatis integris acutis; foliis caulinis integris linearioblanceolatis acutis; loculis subreniformibus 1–2 cm. longis, 1–1.5 cm. latis; replo lineari 3–4 mm. longo, 1 mm. lato; stylo persistente 8–12 mm. longo; loculis dispermis.

Caespitose perennial; radical leaves oblanceolate, acute, entire, slender-petioled; cauline entire, linear-oblanceolate, acute; siliques membranaceous, highly inflated, light yellowish, with a deep open sinus above, cordate below, evenly pubescent with appressed stellae; valves subreniform; replum linear, obtuse at apex, 3–4 mm. long, 1 mm. wide; ovules 2 in each loculus.—UTAH: Red Canyon, 16 miles west of Bryce Canyon National Park, Garfield Co., July 6, 1938, *Reed C. Rollins & T. S. Chambers 2448* (G TYPE, R ISOTYPE); Bryce Canyon, Garfield Co., July, 1930, *Goodman & Hitchcock 1567* (NY).

6. P. DIDYMOCARPA (Hook.) Gray. Perennial, caespitose, silvery-stellate throughout, stellae branched or simple, often stalked; stems numerous, simple, decumbent, rather leafy for the genus, about 1 dm.

high; radical leaves numerous, obovate, repand or dentate, rarely entire, usually with an angular apex, long-petioled, 1.5–4 cm. long, 8–16 mm. wide; cauline oblanceolate, acute, entire or with an occasional tooth, 1–2 cm. long, 4–8 mm. wide; inflorescence congested, elongating in fruit; sepals pubescent, 6–8 mm. long, 1.5–2 mm. wide, often keeled; petals yellow, spatulate, 10–12 mm. long, 3–4 mm. wide; pedicels spreading, straight or very slightly curved, 8–12 mm. long; siliques didymous, inflated, erect, with deep narrow usually closed apical sinus and similar basal sinus, loosely pubescent with spreading stellae; valves 8–12 mm. long, 6–8 mm. wide; replum obovate to broadly oblong, not constricted, obtuse at apex, 3–4 mm. long, 2–3 mm. broad; style 7–9 mm. long; ovules 4 on each side of replum; seeds marginless, brown, about 2.5 mm. broad, 2–3 in each loculus.

Basal leaves entire, rounded; siliques appressed-pubescent..Var. *integrifolia.*
Basal leaves dentate or angular; siliques with a dense spreading pubescence.
Basal leaf-bases lanate, pubescence spreading throughout.....Var. *lanata.*
Basal leaf-bases not lanate, pubescence appressed except on the siliques.....Var. *normalis.*

Var. NORMALIS O. Kuntze, Revis. Gen. **1**: 35 (1891). *P. didymocarpa* Gray, Gen. Illustr. **1**: 162 (1848); Coulter, Man. Rky. Mt. Reg. 26 (1885) in part; Britt. & Brown, Ill. Fl. **2**: 135 (1897) in part and ed. 2. **2**: 156 (1913) in part; Coulter & Nelson, Man. Cent. Rky. Mts. 217 (1909) in part; Rydb. Fl. Rky. Mts. Adj. Pl. 330 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 144 (1918); Rydb., Fl. Pr. Pl. Cent. N. Am. 262 (1933) in part. *Vesicaria didymocarpa* Hook., Fl. Bor.-Am. **1**: 49 (1830). *Coulterina didymocarpa* O. Kuntze, Revis. Gen. **2**: 931 (1891). *P. macrantha* Blankinship in Mont. Agric. Coll. Sci. Stud. **1**, pt. 2: 60 (1905).—Northern Alberta to Wyoming. CANADA: locality uncertain, Rky. Mts., 1858, *Bourgeau* (G, NY); Franklin's Journey (NY). ALBERTA: Kootenay Plains, June, 1908, *S. Brown 970* (G, NY); jct. north fork and n. branch Saskatchewan R., June, 1908, *S. Brown 917* (G); Banff, July, 1907, *Butters & Holway 41* (G, NY); June, 1906, *S. Brown 123* (G); Bow River Pass, Sept., 1879, *Macoun 89* (G); Morley, June, 1885, *Macoun* (G, NY); Rky. Mt. Nat. Park, July, 1897, *Van Brunt 70* (NY); July, 1904, *John Macoun 64432* (G, NY). MONTANA: Little Belt Mts., Aug., 1896, *Flodman 596* (NY); Belt Mts., July, 1886, *F. W. Anderson 411* (NY); Cedar Mt., July, 1897, *Rydberg & Bessey 4168* (NY); Lima, June, 1895, *Shear 3406* (NY); Livingston, 1901, *Scheuber 363* (NY); near Indian Cr., July, 1897, *Rydberg & Bessey 4166* (NY); Bozeman, May, 1901, *E. J. Moore* (G); Midvale, July, 1903, *Umbach 305* (G); Granite Butte, Sept., 1912, *Owen Byrnes 127* (G, isotype of *P. macrantha* Blankin.); Bridger Mts., June, 1897, *Rydberg & Bessey 4167* (G). WYOMING: Glen Cr., Y. N. Park, June, 1899, *A. & E. Nelson 5570* (G, NY); near Mammoth Hot Spgs., July, 1893, *Burglehaus 6318* (NY); Mt. Leidy, Aug., 1897, *Tweedy 391*

(NY); Medicine Mt., Big Horn Co., July, 1936, *L. & R. Williams 3228* (G, NY).

Plants of *P. didymocarpa* are remarkably uniform from the northernmost portion of its range, extending as far south as northern Wyoming, but specimens from west-central Wyoming show certain transitional stages toward its southern analogue, *P. australis*. These plants, while possessing a broad replum and four ovules in each loculus of the ovary, have appressed stellae on the siliques and entire obtuse basal leaves. The whole series is rather obviously a single line and the segregation of *P. australis* as a distinct entity must have been a comparatively recent evolutionary development. Two varieties of *P. didymocarpa* are recognized in the present treatment and apparently represent two lines of divergence from the parent species. Both have distinctive geographical areas which border the southern margin of the range of variety *normalis*.

Var. LANATA A. Nelson in Bull. Torr. Bot. Club **31**: 241. (1904); Coulter and Nelson Man. Cent. Rky. Mts. 217. (1909); Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918). *P. lanata* Rydb. in Bull. Torr. Bot. Club **39**: 322 (1912); Rydb., Fl. Rky. Mts. Adj. Plains 330. (1917).—Central Wyoming. WYOMING: Head of middle fork of Powder River, Big Horn Co., July, 1901, *Goodding 326* (G, NY ISOTYPES); Wallace Creek, Natrona Co., July, 1894, *A. Nelson 674* (G); foothills Sheridan-Buffalo, June–July, 1900, *Tweedy 3585* (NY).

Var. **integrifolia**, var. nov., caespitosa incana; foliis radicalibus integris obovatis; siliquis pubescentibus adpressis.—West-central Wyoming. WYOMING: Grand Canyon of Snake River, Lincoln Co., July 8, 1932, *L. Williams 809* (G TYPE, NY ISOTYPE); hills east of Afton, Lincoln Co., June, 1923, *Payson & Armstrong 3825* (G); Adams Ranch, Jacksons Hole, July, 1901, *Merrill & Wilcox 965* (G); Gros Ventre River, Aug., 1894, *A. Nelson 927* (G); Headwaters Cliff Creek, Aug., 1900, *C. C. Curtis* (NY).

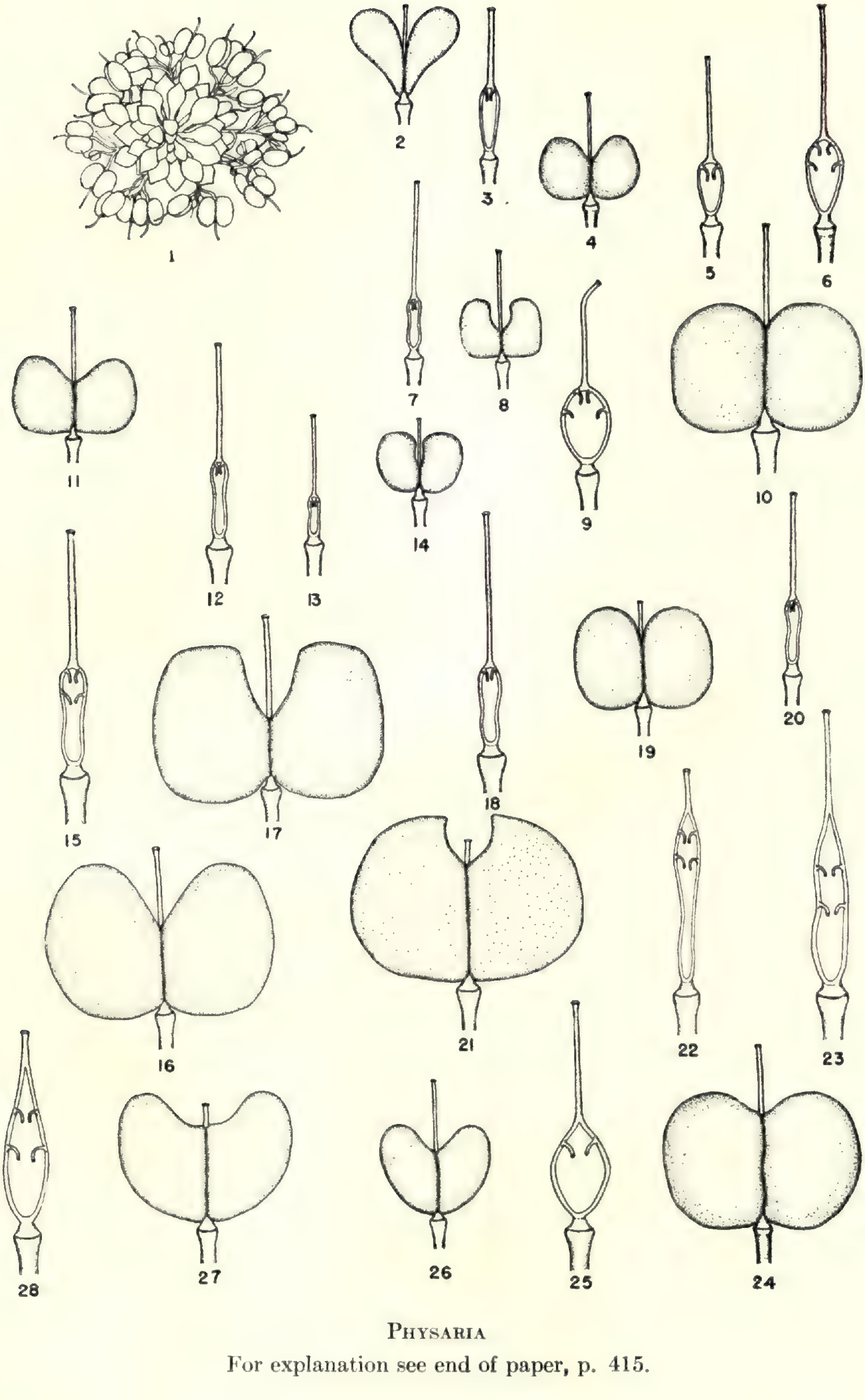
7. P. **condensata**, sp. nov. Herba perennis caespitosa argentea stellato-pubescentia; caulibus simplicibus brevibus 0.5–1 cm. altis; foliis radicalibus numerosissimis integris obovatis 0.5–1.5 cm. longis, 4–8 mm. latis; foliis caulinis paucis oblanceolatis 5–10 mm. longis, 2–3 mm. latis; pedicellis fructiferis divaricatis rigidis 5–10 mm. longis; siliquis inflatis didymis pubescentibus apice basique cordatis; loculis subsphaeroideis 4–8 mm. diametro; replo obovato 3–4 mm. longo, 2–3 mm. lato; stylo persistente 4–6 mm. longo; seminibus suborbicularibus exalatis 2 mm. diametro; cotyledonibus accumbentibus.

Perennial, caespitose, silvery-stellate throughout; caudex simple or rarely branched, greatly enlarged and invested with old leaf-bases; stems several to many, arising laterally from the caudex beneath a dense rosette of leaves, stellate-pubescent, less than 1 cm. long; basal

leaves entire, obovate, tapering abruptly to a narrow petiole, silvery from a dense incrustation of appressed stellae, usually acute, 0.5–1.5 cm. long, 4–8 mm. broad; cauline leaves few, oblanceolate, entire, densely stellate, 5–10 mm. long, 2–3 mm. broad; fruiting raceme congested, subumbellate, often almost sessile; pedicels divaricate, straight, 5–10 mm. long; siliques inflated, didymous with a deep sinus at apex and base, pubescent with loosely spreading stellae, inner surface glabrous, loculi 4–8 mm. in diameter; replum obovate, 3–4 mm. long, 2–3 mm. wide; style 4–6 mm. long; ovules 4 in each loculus, 1 or 2 abortive; seeds brown, orbicular, flattened, marginless, 2–4 in each loculus, about 2 mm. in diameter; cotyledons accumbent; flowers unknown.—WYOMING: limy knoll-crest, foothills of Bridger Butte, 3 miles west of Fort Bridger, Uinta County, June 24, 1938, *Reed C. Rollins 2385* (G TYPE, R ISOTYPE).

Physaria condensata is analogous in growth-form to *Lesquerella condensata* A. Nelson, by which the specific name is suggested. Both species inhabit unprotected knoll-crests in the Upper Sonoran Life-Zone of southwestern Wyoming, though the latter has a much wider geographic range. *P. condensata*, as shown by its technical characters, is most closely related to *P. didymocarpa*. However, the two species differ so strikingly in growth-habit that they could scarcely be confused either in the field or laboratory. *P. condensata* possesses a dense flat rosette of entire leaves which terminates each sobole or the single caudex, resembling in a general way certain flat-leaved species of *Sedum*. The stems are less than a centimeter long and the whole plant is condensed into a tuft less than five centimeters across. The plant in its normal habitat barely projects above the ground-surface. This is strikingly contrasted with the loose habit of growth, well-developed stems and dentate leaves of *P. didymocarpa*.

8. P. **australis** (Payson), comb. nov. Perennial, caespitose, silvery-stellate throughout, stellae many rayed, rays forked; stems numerous, usually somewhat decumbent, simple, arising laterally, 5–15 cm. long including the fruiting raceme; basal leaves numerous, entire or very rarely with a few scattered teeth, 2–8 cm. long, 5–30 mm. broad, blade obovate to orbicular, obtuse; petiole slender, often narrowly winged; cauline entire, spatulate to oblanceolate, usually obtuse, 1–3 cm. long, 3–8 mm. wide; inflorescence racemose, elongating in fruit; sepals linear-oblong, pubescent; petals spatulate, yellow, about 1 cm. long; pedicels divaricate, slightly sigmoid or nearly straight, 6–12 mm. long; siliques erect, didymous, inflated, pubescent, apical sinus deep, narrow and closed or nearly so, basal sinus similar to apical; valves suborbicular, 6–10 mm. high, 3–6 mm. wide; replum oblong, constricted, 2–3 mm. long; ovules 2 in each loculus; style 4–6 mm.



PHYSARIA

For explanation see end of paper, p. 415.

long; seeds brown, suborbicular, wingless, 2–3 mm. broad.—*P. didymocarpa* (Hook.) Gray var. *australis* Payson in Ann. Mo. Bot. Gard. **5.** 144 (1918); E. H. Graham in Ann. Carneg. Mus. **26.** 220 (1937). *P. didymocarpa* Torr. in Stansbury Expl. & Surv. Great Salt Lake App. D. 284 (1852); Rydb., Fl. Colo. 154 (1906) in part; Coulter & Nelson, Manual Cent. Rky. Mts. 217 (1909) in part; Rydb., Fl. Rky. Mts. Adj. Pl. 330 (1917) in part; Tidestrom in Contrib. U. S. Nat. Herb. **25:** 233 (1925).—Idaho and Wyoming to New Mexico and Utah. IDAHO: Soda Springs, Bannock Co., June, 1920, *E. B. & L. B. Payson 1701* (G, NY). WYOMING: Sand Creek, Albany Co., June, 1900, *Nelson 7026* (G, NY); Camel Rock, Albany Co., June 21, 19 ?, *Schwartz & Garner 51* (G); Dyer's Ranch, Carbon Co., June, 1901, *Goodding 80* (G); Fort Steele, Carbon Co., May–June, 1901, *Tweedy 4488* (NY); Bad Water, Fremont Co., June, 1910, *A. Nelson 19403* (G); Green River, Sweetwater Co., June, 1895, *Shear 4364* (US), June, 1938, *Rollins 2241* (G, R); Blacks Fork River, Uinta Co., June, 1937, *Rollins 1653* (G, NY, R); 3 mi. w. Fort Bridger, Uinta Co., May, 1938, *Rollins 2229* (G, R); June, 1938, *Rollins 2387* (G, R); 20 mi. west Big Piney, Lincoln Co., July, 1922, *E. B. & L. B. Payson 2618* (G, NY). COLORADO: Naturita, Montrose Co., April, 1914, *Payson 247* (G); Norwood Hill, San Miguel Co., Aug., 1912, *Walker 490* (G); Paradox, Montrose Co., June, 1912, *Walker 89* (G, US); Hills about Dolores, June, 1892, *C. S. Crandall* (G); 10 mi. so. Montrose, Montrose Co., May, 1938, *Rollins 2134* (G); 8 mi. w. Grand Junction, Mesa Co., May, 1938, *Rollins 2176* (G, R); 20 mi. no. Rifle, Rio Blanco Co., May, 1938, *Rollins 2209* (G, R); dry hills near Meeker, Rio Blanco Co., May, 1938, *Rollins 2220* (G, R); Durango, June, 1898, *Crandall* (NY); Mancos, June, 1898, *Baker, Earle & Tracy 75* (G, US); Mesa Verde Park, May, 1925, *A. Nelson 10425* (NY). NEW MEXICO: Aztec, April, 1899, *Baker 356* (G, NY, US); vicinity of Farmington, San Juan Co., July, 1911, *Standley 7129* (US). UTAH: Logan Canyon, Cache Co., April, 1911, *C. P. Smith 2331* (NY), May, 1934, *Bassett & Ruth Maguire 15956* (G); Wahsatch Mts., July, 1869, *S. Watson 83* (NY); Orangeville, June, 1894, *M. E. Jones 5464* (US); Price, June, 1900, *Stokes* (NY); Theodore, Uintah Co., May, 1908, *M. E. Jones* (NY); 47 mi. so. Moab, June, 1933, *B. Maguire et al. 5809* (US); Flaming Gorge, Daggett Co., May, 1932, *L. Williams 458* (G, NY); La Sal Mts., July, 1911, *Rydberg & Garrett 8573* (NY); June, 1913, *M. E. Jones* (NY); 4 mi. w. Willow Creek, Uintah Co., June, 1937, *Rollins 1708* (G, R).

A careful examination of numerous specimens of Payson's variety *australis* has revealed a number of fundamental characteristics which indicate its distinctness as a separate species from *P. didymocarpa*. Chief among these is a reduced number of ovules in each loculus of the ovary. In *P. didymocarpa* there are four[1] ovules in each of the two

[1] Figs. 9 and 10, tab. XVI, Hook. Fl. Bor.-Am. must certainly be in error as to the number of ovules. I have examined the siliques of over thirty collections of this

loculi. Often one and sometimes two ovules abort, consequently only two or three seeds mature on each side of the replum. *P. australis* has only two ovules in each loculus and the funiculi are at the very apex of the replum. Usually one of the two ovules aborts, leaving only one which matures. Equally consistent but possibly less fundamental is the difference in the nature of the replum of these species. *P. australis* has a very narrowly linear constricted replum which is less than 1 mm. wide, whereas the replum of *P. didymocarpa* is oblong to obovate and 2–3 mm. wide. When these constant differences are added to those pointed out by Payson the specific nature of *P. australis* becomes apparent.

9. P. GRAHAMII Morton. Perennial, caespitose, densely pubescent throughout with spreading stellae; stems simple, somewhat decumbent, about 1.5 dm. long; basal leaves numerous, broadly oblanceolate to broadly spatulate, obtuse, irregularly pinnatifid, 10–15 cm. long, about 3 cm. broad, distal lobes large and variable; cauline few, dentate or rarely entire; pedicels divergent, 5–15 mm. long; sepals linear-oblong, pubescent, about 5 mm. long; petals yellow, spatulate, 6–8 mm. long; siliques erect, didymous, inflated but not highly so, shallow sinus below, deep sinus above; replum linear-oblong, somewhat constricted, ovules 2 on each side; style 6–8 mm. long; mature seeds unknown.—Morton in E. H. Graham in Ann. Carneg. Mus. **24**: 220 (1937).—UTAH: Chandler Canyon, Uinta Basin, Uintah County, Aug. 3, 1935, *Graham 9976* (US TYPE).

The type of this species is not altogether satisfactory because the fruits are very immature. Its distinctiveness rests upon the fact that the whole plant is covered with very loose spreading stellae and that the large basal leaves are deeply lobed along the margins. *P. Grahamii* is at present known only from the type collection.

10. P. BRASSICOIDES Rydberg. Perennial, caespitose, silvery-stellate throughout, stellae with forked rays; stems several to numerous, rather stoutish for the genus, simple, arising laterally, 5–15 cm. long including the fruiting raceme; basal leaves numerous, thick, scurfy above, repand or rarely entire, 2–6 cm. long, 1–2.5 cm. broad, blade orbicular to obovate, petiole somewhat winged; cauline few, oblanceolate to broadly spatulate, obtuse or approaching acuteness, entire, 1–2 cm. long, 3–5 mm. wide; sepals linear-oblong, 6–8 mm. long, about 1 mm. wide; petals yellow, spatulate, about 1 cm. long, 3–4 mm. wide; pedicels divergent, straight or somewhat curved, 5–10 mm. long; si-

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species and consistently find four ovules on each side of the replum. The drawings are also in error as to the acute apex of the replum. This is characteristic of *P. Geyeri* and is probably taken from Douglas' plants which Hooker cited. The apical angle of the replum of *P. didymocarpa* is decidedly obtuse.

liques didymous, erect, cordate, inflated but not greatly so, loosely but densely pubescent with spreading stellae, obtuse or with an obscure sinus at base, apical sinus deep and broad, valves 6–8 mm. high; replum linear-oblong, constricted, 3–4 mm. long, about 1 mm. wide; ovules 2 in each loculus; style 4–5 mm. long; seeds brown, 2–3 mm. broad.—Bull. Torr. Bot. Club **29**: 237 (1902); Peterson, Fl. Neb. 62 (1912); Rydb., Fl. Rky. Mts. Adj. Pl. 331 (1917); Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918); Rydb., Fl. Pr. Pl. Cent. N. Am. 362 (1932). *P. didymocarpa* Britt. & Brown, Ill. Fl. ed. 2. **2**: 156 (1913) in part; Bergman, Fl. N. Dak. 191 (1918); Winter in Contrib. Bot. Surv. Neb. n. s. **10**: 71 (1936).—NORTH DAKOTA: Medora, July 17, 1898, *L. R. Waldron* (NDA, NY); June 19, 1910, *H. F. Bergman* (NDA); Gorham, McKenzie Co., May, 1938, *E. C. Moran 399 & 400* (G). SOUTH DAKOTA: cultivated at Brookings from seed collected in badlands, *Th. A. Williams* (G). NEBRASKA: canyon south of Scott's Bluff, Scott's Bluff Co., July, 1891, *Rydberg 24* (NY TYPE, US ISOTYPE); badlands, 1853–4, *F. V. Hayden* (NY). WYOMING: 1 mi. northwest of Hulett, Crook Co., May, 1935, *Owenby 610* (NY, R).

An inhabitant of bluffs and badlands in the western plains region, *P. brassicoides* is one of the least known species of the genus *Physaria*. Its affinities are with *P. didymocarpa* var. *lanata* on the one hand and *P. vitulifera* on the other. The dense loose whitish vestiture of the siliques immediately suggests *P. didymocarpa* and its variety *lanata*, but the replum is constricted, the ovules number two in each cell and the base of the silique is almost devoid of a sinus like that of *P. vitulifera*. From the latter species it differs in having very much larger, almost entire thickish basal leaves, larger more highly inflated obpyriform siliques and a longer replum. Little difficulty should be experienced in placing specimens of this rather unique species.

11. P. VITULIFERA Rydberg. Perennial, caespitose, silvery stellate-pubescent throughout; stellae with numerous branched rays; stems numerous, usually decumbent, arising laterally, simple, rather coarse, 1–2 dm. long including fruiting raceme; basal leaves numerous, pandurate or merely obovate, obtuse, margins deeply and broadly incised or rarely almost entire, 3–6 cm. long, 1–2 cm. broad; cauline entire, oblanceolate to spatulate, often somewhat acute, 3–6 mm. broad; inflorescence congested, elongating in fruit; sepals oblong, pubescent, 6–8 mm. long, 1.5–2 mm. wide; petals yellow, spatulate, about 1 cm. long, 3–4 mm. wide; pedicels sigmoid, the end usually curving upward; siliques didymous, often rigid, inflated, somewhat angular, pubescent with loose spreading stellae, obtuse or truncate below, apical sinus broad, open and deep; valves 5–6 mm. high, 3–4 mm. broad; replum oblong, often constricted, 2–3 mm. long, less than 1 mm. wide, 2 ovules on each side; style 5–7 mm. long; seeds 1–2 in each loculus,

brown, about 2.5 mm. broad, wingless.—Bull. Torr. Bot. Club **28**: 278 (1901); Rydb., Fl. Colo. 154 (1906); Coulter & Nelson, Man. Cent. Rky. Mts. 218 (1909); Rydb., Fl. Rky. Mts. Adj. Pl. 330. (1917); Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918). *P. didymocarpa* Clements & Clements, Rky. Mt. Fls. 25 (1914) in part. *P. didymocarpa* β *contractoreplum* O. Kuntze, Revis. Gen. Pl. **1**: 35 (1891).—COLORADO: without locality, Sept., 1874, *O. Kuntze 3058* (NY isotype of *P. didymocarpa* β *contractoreplum*); Idaho Springs, Aug., 1895, *Rydberg* (NY TYPE); June, 1916, *Clokey 2753* (NY); Aug., 1895, *Shear 3269* (NY, US); near Golden, June, 1918, *Churchill* (G); July, 1917, *E. L. Johnston 1019* (G); April, 1892, *Crandall 45* (NY, US); May, 1920, *Duthie & Clokey 3777* (Cl, G, NY, US); Morrison, Jefferson Co., July, 1920, *Clokey 3776* (Cl); near Boulder, July, 1902, *Tweedy 5068* (NY); Clear Creek-Middle Park, 1861, *Parry 101* (G, NY); Platte River, Evans, June, 1910, *E. L. Johnston 633 & 633b* (NY).

P. vitulifera has two close relatives in *P. floribunda* and *P. Osterhoutii*. Its position appears to be somewhat intermediate between these two species both morphologically and geographically. The plant ranges along the western edge of the plains and in canyons and valleys toward the interior of the central Rocky Mountains of Colorado. *P. Osterhoutii* occurs northwest and *P. floribunda* occurs to the south and west of this area.

The basal leaves of *P. vitulifera* are similar to those of *P. floribunda*, but they are nearly always obtuse instead of acute and obovate instead of broadly oblanceolate. The fruits are angular, rigid in appearance and not highly inflated. Stellae on the siliques are not appressed as on the foliage, but, as in *P. Osterhoutii*, spread at almost right angles from it. As a biological entity, the boundaries of *P. vitulifera* are seemingly well defined; however, recent connections with its relatives are strongly indicated.

12. P. OSTERHOUTII Payson. Perennial, caespitose, silvery-stellate throughout, rays of stellae usually forked; caudex simple or branched; stems slender, numerous, erect or somewhat decumbent, arising laterally, simple, 8–15 cm. long including the raceme; basal leaves oblanceolate, often hastate, incised or with broad teeth along the petiole, rarely entire, 2–5 cm. long, 8–15 mm. wide; cauline linear-oblanceolate, acute, entire or rarely with a few teeth, 1–2 cm. long, 2–3 mm. wide; inflorescence congested, flowers numerous; sepals linear-oblong, yellowish, pubescent, 5–7 mm. long, about 1 mm. wide; petals yellow, spatulate, 8–10 mm. long, 3–4 mm. wide; pedicels recurved in fruit, 1–1.5 cm. long; fruiting raceme congested, 4–8 cm. long; siliques pendant, base truncate or obtuse, apex deeply emarginate; valves inflated but not highly so, 5–7 mm. long, 4–5 mm. broad,

rather loosely stellate-pubescent; replum oblong or slightly broader, obtuse at apex, 2–3 mm. long; style 4–5 mm. long; ovules 2 on each side of replum; seeds orbicular, marginless, 1–2 in each loculus, about 2 mm. broad.—Ann. Mo. Bot. Gard. **5**: 146 (1918).—COLORADO: Kremmling, Grand Co., June, 1907, *Osterhout 3477* (NY ISOTYPE 2 sheets); Sulphur Springs, July, 1907, *F. E. Clements* (NY).

This species is very closely related to *P. vitulifera*, differing only in a few characters which appear to be of relatively minor importance. *P. Osterhoutii* has more slender nearly entire basal leaves which are acute instead of obtuse as in *P. vitulifera*, more numerous stems and a pendant instead of erect silique. The distinctness of the entity as a species must remain in doubt at present. Certainly a larger series of specimens together with accurate field data are needed to establish the range of variability and precise relationships of this unit. Its known range is entirely in north-central Colorado.

13. P. ACUTIFOLIA Rydberg. Perennial, caespitose, silvery stellate-pubescent throughout, stellae with branched rays; stems several to numerous, decumbent, simple, slender, 5–10 cm. long including fruiting raceme; basal leaves oblanceolate or broader, acute, entire or with one or two broad teeth, 2–3.5 cm. long, 5–10 mm. wide, blades sometimes triangular; cauline few, oblanceolate, entire, acute, 1–1.5 cm. long, 2–4 mm. wide; inflorescence congested, elongating moderately in fruit; sepals linear, 5–7 mm. long, 1 mm. wide; petals yellow, spatulate, often somewhat truncate at apex, 8–10 mm. long, 2–3 mm. wide; pedicels spreading, somewhat sigmoid, 5–8 mm. long; siliques erect, didymous, inflated, slightly cordate at base or nearly obtuse, apical sinus broad and deep; valves suborbicular, 4–5 mm. wide, 6–8 mm. high; replum obovate to slightly longer, obtuse at apex, rarely somewhat constricted toward base, about 3 mm. long, about 1.5 mm. wide; style 5–7 mm. long; ovules 2 on each side of replum; seeds orbicular, brown, only slightly flattened, about 2 mm. broad, 1–2 in each loculus.—Bull. Torr. Bot. Club. **18**: 279 (1901); Rydb., Fl. Colo. 154 (1906) in part; Fl. Rky. Mts. Adj. Pl. 331 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918). *P. floribunda* Nelson, Coulter & Nelson Man. Cent. Rky. Mts., 218 (1909) in part.—COLORADO: Grand Junction, Mesa Co., June, 1892, *A. Eastwood* (NY TYPE); South Park, *Wolf & Rothrock 642* (G); Steamboat Springs, Routt Co., July, 1903, *Goodding 1623* (G, NY, US); Ruxton Ridge, Pikes Peak, July, 1901, *F. E. & E. S. Clements 97* (G, NY, US); 10 mi. east of Sapinero, Gunnison Co., May, 1938, *Rollins 2106* (G, R); 5 mi. east of Parlin, Gunnison Co., May, 1938, *Rollins 2088* (G, R); Caldwell Cr., Rio Grande Nat. Forest, Mineral Co., June, 1911, *Murdoch 4542* (NY).

P. acutifolia belongs to the *floribunda-Osterhoutii-vitulifera* group, but differs from all in having smaller entire acute leaves, slender short

stems and an obovate unconstricted replum. Of this group, *P. floribunda* stands closest to *P. acutifolia* and it is quite possible that further investigation will show them to be varieties or phases of a single species. More field-work in the area where these species occur will be necessary before the case can be fully clarified. At present it seems that the dissected basal leaves, descending or obliquely spreading pedicels, greater size and linear-oblong constricted replum of *P. floribunda* are sufficient to distinguish it from its near relative. *P. acutifolia* is found at middle elevations in the central Rocky Mountains of Colorado and is known to be particularly abundant in the Gunnison Basin.

14. P. FLORIBUNDA Rydberg. Perennial, caespitose, silvery stellate-pubescent throughout, stellae with branched rays; stems numerous, simple, arising laterally, decumbent or erect, 1–2 dm. long including the fruiting raceme; radical leaves broadly oblanceolate, pinnatifid or merely dentate, rarely almost entire, 4–8 cm. long, 1–2 cm. wide, terminal lobe acute or obtuse but not rounded, petiole usually winged; cauline spatulate to linear-oblanceolate, acute, entire or rarely few-toothed, 1–3 cm. long, 3–6 mm. wide; inflorescence loosely racemose, greatly elongating in fruit; sepals linear-oblong, 5–7 mm. long, 1–2 mm. wide; petals yellow, spatulate, 9–11 mm. long, about 3 mm. wide; pedicels spreading or somewhat recurved, usually sigmoid, slender, 6–12 mm. long; siliques erect divergent or nearly pendant, didymous, inflated but not greatly so, obtuse or slightly cordate at base, deeply and broadly notched above, valves 4–6 mm. high, 3–5 mm. wide; replum linear-oblong, constricted, 2.5–4 mm. long, less than 1 mm. wide, obtuse at apex, ovules 2 on each side; style 5–8 mm. long; seeds brown, orbicular, about 2 mm. broad, marginless, 1–2 in each loculus.—Bull. Torr. Bot. Club **18**: 279 (1901); Fl. Colo. 154 (1906) in part; Coulter & Nelson, Man. Cent. Rky. Mts. 218 (1909) in part; Rydb., Fl. Rky. Mts. Adj. Pl. 330 (1917); Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918).—COLORADO: west slope LaVeta Pass, Costilla Co., *McKelvey 4787 & 4789* (G); *Bethel, Willey & Clokey 4130* (Cl, G); Sangre de Cristo Creek, July, 1900, *Rydberg & Vreeland 6135* (NY TYPE); *Rydberg & Vreeland 6136* (NY); Cimarron, Gunnison Co., June, 1901, *Baker 38* (G, NY, US); 3 mi. east of Sapinero, Gunnison Co., May, 1938, *Rollins 2108* (G, R); Wolcott, July, 1898, *Shear & Bessey 5295* (NY, US); Glenwood Springs, Garfield Co., June, 1920, *Osterhout* (Cl); Ruxton, Pikes Peak, 1896, *Clements 160* (NY); Bostwick Park, Montrose Co., Aug., 1937, *Rollins 1983* (G, R); July, 1917, *Payson* (US); Ridgway, Ouray Co., June, 1924, *E. B. & L. B. Payson 3832* (G); 3 mi. ne. of Cedaredge, Delta Co., May, 1938, *Rollins 2150* (G, R); 10 mi. n. of Mesa, Mesa Co., May, 1938, *Rollins 2194* (G, R); near Mesa, Mesa Co., May, 1938, *Rollins 2197* (G, R). NEW MEXICO: 10 miles east of Taos, Taos Co., July, 1938, *Rollins & Chambers 2414* (G, R).

P. floribunda is not only more robust than its immediate relatives, but differs from them markedly on characters of the fruits, pedicels and radical leaves. The relationships of this species have been discussed above and need not be stressed further. It is believed that the collection above cited from New Mexico represents the first record of this species from that state.

Explanation of Plate 556

Physaria condensata, n. sp.: fig. 1, plant, × 1; fig. 9, replum, × 2½; fig. 10, silique, × 2½; from *Rollins 2385*.
P. brassicoides Rydb.: fig. 2, silique, × 1½; fig. 3, replum, × 2½; from *Rydberg 24*.
P. acutifolia Rydb.: fig. 4, silique, × 1½; fig. 5, replum, × 2½; from *Eastwood* in 1892.
P. didymocarpa (Hook.) Gray: fig. 6, replum, × 2½; from *Macoun 89*.
P. vitulifera Rydb.: fig. 7, replum, × 2½; fig. 8, silique, × 1½; from *Rydberg*, Aug. 26, 1895.
P. floribunda Rydb.: fig. 11, silique, × 1½; fig. 12, replum, × 2½; from *Rydberg* and *Vreeland 6136*.
P. Osterhoutii Pays.: fig. 13, replum, × 2½; fig. 14, silique, × 1½; from *Osterhout 3477*.
P. Chambersii, n. sp.: fig. 15, replum, × 2½; fig. 16, silique, × 1½; from *Rollins* and *Chambers 2502*.
P. Chambersii Rollins, var. membranacea, n. var.: fig. 17, silique, × 1½; fig. 18, replum, × 2½; from *Rollins* and *Chambers 2448*.
P. australis (Payson) n. comb.: fig. 19, silique, × 1½; fig. 20, replum, × 2½; from *Rollins 1653*.
P. Newberryi Gray: fig. 21, silique, × 1½; fig. 22, replum, × 2½; from *Osterhout 7000*.
P. alpestris Suksdorf: fig. 23, replum, × 2½; fig. 24, silique, × 1½; from *Thompson 8708*.
P. Geyeri (Hook.) Gray: fig. 25, replum, × 2½; fig. 26, silique, × 1½; from *Henderson 2384*.
P. oregona Wats.: fig. 27, silique, × 1½; fig. 28, replum, × 2½; from *Cusick 1895*.

III. THE VARIETIES OF CONVOLVULUS SPITHAMAEUS AND OF C. SEPIUM

R. M. Tryon, Jr.

(Plates 557 and 558)

Plant erect; flowers usually 1–2, rarely 3–4, white; basal leaves not more than one-half as long as some of the upper leaves, often greatly reduced; petioles not more than one-half as long as the blade, usually not more than one-fourth as long.....*C. spithamaeus.*
Plant extensively twining or trailing; flowers several in mature specimens, more than 4, white or pink; basal leaves only slightly reduced; petioles more than one-half as long as the blade.....*C. sepium.*

C. SPITHAMAEUS L.

Plant pubescent or glabrate, short, compact, the tip not prolonged; leaves usually truncate, rounded or auricled at the base, sometimes sagittate; petiole of the first leaf above the uppermost flower not more than one-fourth as long as the blade.....*C. spithamaeus* (typical).
Plant densely pubescent, tall, the tip prolonged; leaves sagittate; petiole of the first leaf above the uppermost flower about one-half as long as the blade.....var. *Catesbeianus*.

CONVOLVULUS SPITHAMAEUS L., Sp. Pl. 158 (1753) (typical).[1] PLATE 557, FIGS. 1, 2. *Convolvulus stans* Michx., Fl. Bor.-Am. **2**: 136 (1803). *Calystegia spithamaea* (L.) Pursh, Fl. Am. Sept. **1**: 143 (1814). *Volvulus spithamineus* O. Ktze., Rev. Gen. **2**: 447 (1891). *Convolvulus camporum* Greene, Pittonia **3**: 328 (1898). *Volvulus spithamaeus* (L.) Farwell in Am. Midl. Nat. **9**: 274 (1925). *Volvulus spithamaeus* (L.) Farwell var. *stans* (Michx.) Farwell in Am. Midl. Nat. **9**: 274 (1925). *Convolvulus spithamaeus* L. var. *stans* (Michx.) Fogelberg in Trans. Wis. Acad. Sci. **30**: 24 (1937).

The type specimen of *C. spithamaeus* is pubescent, erect, short and compact, the leaves slightly rounded at the base or auricled, the petiole of the first leaf above the uppermost flower not more than one-fourth as long as the blade. This description must be extended to include several minor variations: plant densely pubescent to glabrate, erect, short and compact or sometimes tall; the leaves about 2–6 cm. long, 1–2.5 cm. wide, tapering, rounded, auricled or sagittate at the base; petiole of the first leaf above the uppermost flower 0.2–1.5 cm. long, usually not more than one-fourth as long as the blade, rarely nearly one-third as long.

Southwestern Quebec to Ontario and Minnesota, south to Iowa, Illinois, Pennsylvania and Maryland and in the mountains to West Virginia and Virginia. Representative specimens: QUEBEC: Hull, June 12, 1925, *Rolland-Germain*, no. 19,308. MAINE: Limingston, York Co., Aug. 29, 1916, *Fernald, Long & Norton*, no. 14,414. NEW HAMPSHIRE: Merrimack, Hillsboro Co., June 19, 1918, *C. F. Batchelder*. MASSACHUSETTS: Dunstable, Middlesex Co., June 9, 1928, *Bill, Grigg & Sanford*. CONNECTICUT: Southbury, New Haven Co., June 9, 1906, *G. H. Bartlett*, no. 1,236. NEW YORK: Glenmont, Albany Co., June 14, 1923, *House*, no. 9,331. NEW JERSEY: Riddleton, June 14,

[1] Index Kewensis **3**: 236 (1894) gives several combinations under *Milhania*, a genus taken from Necker by Rafinesque and applied by him to *Calystegia* of R. Brown. The combinations are credited to Rafinesque, Fl. Tell. **4**: 71 (1838) but he actually did not make any combinations under *Milhania*. He probably made the combinations under "*Calistegia*" R. Br. but since he also mentions *Convolvulus*, and says only "*C. sepium*" etc., and since all except three of his own names are without basinym, reference or description, all of the names are ignored.

CONVOLVULUS SPITHAMAEUS: FIG. 1, type, × 2/3; FIG. 2, plant, × ½, from Ontario.
C. SPITHAMAEUS, var. CATESBEIANUS: FIG. 3, type, × ½.

CONVOLVULUS SEPIUM: FIG. 7, leaf and flower, × ⅓, from England.
C. SEPIUM, var. COMMUNIS: FIGS. 1 and 2, leaf and flower, × ½, from TYPE.
C. SEPIUM, var. AMERICANUS: FIG. 3, plant, × ⅓.
C. SEPIUM, var. FRATERNIFLORUS: FIGS. 4 and 5, leaf and flower, × ⅓, from North Dakota; FIG. 6, leaf and flower, × ⅓, from Missouri (TOPOTYPE).
C. SEPIUM, var. REPENS: FIG. 8, TYPE, × ½.
C. SEPIUM, var. REPENS, forma NASHII: FIG. 9, leaf, × ¾.

1895, *C. D. Lippincott.* PENNSYLVANIA: Frazer, Chester Co., June 18, 1910, *E. B. Bartram.* MARYLAND: Chevy Chase, May 27, 1905, *A. Chase*, no. 2,846. DISTRICT OF COLUMBIA: Washington, June 4, 1882, *L. F. Ward.* WEST VIRGINIA: Wardensville, Hardy Co., July 10, 1932, *Hunnewell*, no. 12,417. VIRGINIA: Warm Spring Mt., Batte Co., July 6, 1933, *Hunnewell*, no. 12,916. ONTARIO: Tobermory, June 24, 1934, *Krotkov*, no. 9,340. MICHIGAN: Norway, Dickinson Co., July 8, 1934, *Fernald & Pease*, no. 3,485. KENTUCKY: Fleming Co., June 4, 1938, *E. L. Braun.* WISCONSIN: Minong, Washburn Co., June 19, 1929, *Fassett*, no. 8,635. ILLINOIS: Dear Park, La Salle Co., June 1–7, 1909, *Greenman, Lansing & Dixon*, no. 138. MINNESOTA: North Lake, Cook Co., July 3, 1917, *Lange*, no. 12.

C. SPITHAMAEUS L. var. **Catesbeianus** (Pursh), n. comb. PLATE 557, FIG. 3. *Calystegia Catesbeiana* Pursh, Fl. Am. Sept. **2**: 729 (1814). *Convolvulus Catesbeianus* (Pursh) Elliot, Sketch **1**: 255 (1817). *Convolvulus Catesbei* Spreng., Syst. **1**: 603 (1825). *Convolvulus sepium* L. var. *Catesbeianus* (Pursh) Fernald in RHODORA **37**: 439 (1935), as to name-bringing synonym.—Plant densely pubescent, tall, the tip prolonged; leaves 3–6 cm. long, 2–3 cm. wide, sagittate; petiole of the first leaf above the uppermost flower 1–3 cm. long, at least one-third as long as the blade.—In the mountains from Virginia to "Carolina," Georgia and Alabama. Representative specimens: VIRGINIA: Holston River near Add Wolf, Smyth Co., June 15, 1892, *J. K. Small;* Bedford Co., June 19, 1871, *A. H. Curtiss.* GEORGIA: Stone Mt., May 14, 1901, *A. H. Curtiss*, no. 6,784. ALABAMA: Auburn, Lee Co., April 17, 1897, *Earle & Baker.*

The description has been drawn from a photograph of the type specimen secured by Prof. Fernald through the kindness of Dr. Nicholas Polunin. There has been some confusion in the application of Pursh's name but a study of the type clearly shows that it belongs under *C. spithamaeus* rather than under *C. sepium*, where it was formerly placed.

Synonyms of an intermediate between *C. spithamaeus* and var. *Catesbeianus* are: *Calystegia tomentosa* Pursh, Fl. Am. Sept. **1**: 143 (1814). *Convolvulus stans* sensu Wherry in Torreya **29**: 105 (1929), not Michx. *Convolvulus Purshianus* Wherry in Proc. Pa. Acad. Sci. **7**: 163 (1933).

This species, although admittedly variable, has been commonly considered to have no segregates. Pursh separated a *Calystegia tomentosa* but he was not followed by later authors. Greene in 1898 described a *Convolvulus camporum* from the Middle West but his description fits typical *Convolvulus spithamaeus* perfectly and it is not clear why he thought his material was distinct. Wherry in 1929

revived Michaux's *Convolvulus stans*, described from near Lake Champlain, to represent material he collected on shale-barrens in Pennsylvania. Later, after collecting *Convolvulus spithamaeus* near Montreal and recognizing that the northern plant was "merely a hairy extreme of *C. spithamaeus*" and not identical with his Pennsylvania material, he described the la ter as *Convolvulus Purshianus*, based on *Calystegia tomentosa* Pursh. This is an intermediate between typical *Convolvulus spithamaeus* and var. *Catesbeianus*.

In 1925 Farwell recognized *Convolvulus stans* Michx. as a variety under *Volvulus spithamaeus* and in 1937 Fogelberg recognized it under *Convolvulus spithamaeus*. The bulk of *Convolvulus spithamaeus* may be roughly divided into two groups: one very pubescent with sagittate leaves (this is Michaux's plant which he described as "totus candi-candi-subtomentosus: foliis . . . subcordato-ovalibus . . ."); the other less pubescent, with tapering, rounded or auricled leaf-bases. The first (PLATE 557, FIG. 2) is the common northern form, from Quebec to Minnesota, extending southward in New York and Pennsylvania in the mountains; the second (PLATE 557, FIG. 1) is the common form in Iowa, Illinois, Indiana, Ohio, New York, Pennsylvania and the seaboard states. However, because there is no good correlation between leaf-shape and pubescence and because the ranges overlap a great deal, there is no reasonable basis on which to separate these two variations.

However, var. *Catesbeianus* is an apparently overlooked southern series of *Convolvulus spithamaeus*, extending from Virginia to Alabama along the Appalachian System, which, varying only slightly from the typical form in Pennsylvania, reaches an extreme in Georgia and Alabama.

C. SEPIUM L.

This species is quite variable in leaf-shape, flower-color and pubescence and, although good technical characters have been sought as a basis of separation, none have been found, and it is necessary to fall back on vegetative characters and flower-color to segregate several fairly good geographical varieties.

Leaves hastate, the blade proper usually more than one-half as broad as long, or essentially sagittate; basal lobes angled.
Leaves essentially sagittate; peduncles about twice as long as the petioles, often exceeding the leaves . . . . . *C. sepium* (typical).
Leaves hastate; peduncles usually longer than the petioles but not exceeding the leaves.

Corolla pink, plant essentially glabrous.....var. *communis.*
Corolla white, plant glabrous or pubescent.....var. *fraterniflorus.*
Leaves usually sagittate, or if hastate the blade proper less than one-half as broad as long; basal lobes rounded or slightly pointed.
Corolla pink; peduncles often exceeding the leaves.....var. *americanus.*
Corolla white, rarely tinged with pink on the margin; peduncles usually shorter than the leaves.
Leaf-blade not conspicuously narrow, mostly glabrate.....var. *repens.*
Leaf-blade very narrow, mostly densely pubescent..var. *repens* f. *Nashii.*

CONVOLVULUS SEPIUM L., Sp. Pl. 143 (1753) (typical). PLATE 558, FIG. 7. *Calystegia sepium* (L.) R. Br., Fl. Nov. Holl. 483 (1810). *Volvulus sepium* (L.) Junger in Oest. Bot. Zeitschr. **41**: 133 (1891).—Plant essentially glabrous; leaves about 4–10 cm. long, 3.5–7 cm. wide, hastate-sagittate or sagittate, with the basal lobes angled; corolla white; peduncles 3–7 cm. long, about twice as long as the petioles, often exceeding the leaves.—Introduced sparingly from Europe. Representative specimens: GERMANY: Regensburg, Bavaria, July 1906, *Ig. Familler.* ITALY: Venitia, June 1911, *A. Beguinot*, no. 1,728. NEWFOUNDLAND: St. Johns, 1928, *A. M. Ayre.* NOVA SCOTIA: Yarmouth, Yarmouth Co., July 24, 1920, *Long & Linder*, no. 22,326. NEW BRUNSWICK: Ingleside, Kings Co., Aug. 8, 1909, *Fernald.*

Var. **communis**, n. var., corolla rosea; folia hastata, basi lobis angularis; planta prope glabra. TAB. 558, FIG. 1, 2. *Calystegia Maximilliana* Nees in Neuwied, Riese Nord. Am. **2**: 443 (1841) probably belongs here. *Convolvulus sepium* L. var. *americanus* sensu authors, not Sims.—Plant essentially glabrous; leaves about 5–10 cm. long, 2–5 cm. wide, hastate, the basal lobes angled; corolla pink; peduncles 4–12 cm. long, usually exceeding the petioles but rarely the leaves.—Southern Quebec south to Virginia and sparingly to Florida, west to Minnesota, Oregon and Washington. This is the common plant throughout the northeastern United States. Representative specimens: QUEBEC: Bonaventure River, Gaspé Co., Aug. 14, 1930, *Victorin, Germain & Jacques*, no. 33,752. MAINE: Frankfort, Waldo Co., July 21, 1916, *Fernald & Long*, no. 14,417. NEW HAMPSHIRE: Colebrook, Coos Co., July 17, 1907, *A. H. Moore*, no. 3,927. VERMONT: Manchester, Bennington Co., July 14, 1898, *M. A. Day*, no. 122. MASSACHUSETTS: Dennis, Barnstable Co., Aug. 16, 1919, *Fernald & Long*, no. 19,025. CONNECTICUT: Farmington, Hartford Co., Aug. 2, 1902, *Driggs & Holcomb.* NEW YORK: Oneida Lake, Madison Co., Aug. 18, 1930, *House*, no. 17,891. NEW JERSEY: Merchantville, Camden Co., June 2, 1921, *H. B. Meredith.* PENNSYLVANIA: Wissahickon Creek, Philadelphia Co., June 29, 1924, *H. A. Lang.* FLORIDA: 1844, *F. Rugel*, no. 155. OHIO: Mansfield, June 17, 1895, *Wilkinson*, no. 7,662 (TYPE in the Gray Herbarium). ILLINOIS: Stony Island, Cook Co., June 30, 1914, *H. H. Smith*, no. 5,972. MINNESOTA: Thompson, July 1891, *J. H. Sandberg*, no. 389. OREGON: Salem, Aug. 10, 1920, *J. C. Nelson*, no. 3,296. WASHINGTON: Almota, Aug. 9, 1896, *C. V. Piper.*

Var. AMERICANUS Sims in Bot. Mag. t. 732 (1804). PLATE 558, FIG. 3. *Convolvulus inflatus* Desf., Tabl. l'École Bot. 74 (1804), nomen nudum, identity inferred by reference in Sweet, Hort. Brit. Ed. 2, 370 (1830). *Calystegia inflata* Desf. ex Sweet, Hort. Brit. Ed. 2, 370 (1830) by reference to Bot. Mag. t. 732. *Convolvulus sepium* var. *incarnatus* Sweet, Hort. Brit. Ed. 2, 370 (1830), published in synonymy. *Calystegia riparia* Raf., New Fl. Am. **2**: 29 (1837), ex char. *Convolvulus sepium* L. var. *rosea* Choisy, in DC. Prod. **9**: 433 (1845). *Calystegia sagittata* Turcz. in Bull. Imp. Nat. Soc. Mosc. **22**^{2}: 56 (1849), ex char. *Convolvulus americanus* (Sims) Greene, Pittonia **3**: 328 (1898). *Volvulus sepium* (L.) Junger var. *americanus* (Sims) Farwell in Ann. Rep. Comm. Parks & Boulev. Detroit **11**: 81 (1900). *Calystegia americana* (Sims) Daniels in Univ. Mo. Studies; Sci. Series 1, no. 2, 195 (1907). *Volvulus* "*inflatus* (Desf.) Dr." [uce], Brit. Pl. List 82 (1928), with *taxonomic* synonym, "*Convolvulus sylvat.*[*icus*] W. & K.," as shown by basinym of *Convolvulus inflatus* Desf. supplied by Druce in Rep. Bot. Exch. Cl. Brit. Isles **8**: 872 (1929). *Convolvulus sepium* L. var. *pubescens* (Gray) Fernald, sensu Fernald in RHODORA **10**: 55 (1908).—Plant usually pubescent or sometimes essentially glabrous; leaves about 4–10 cm. long, 3–6 cm. wide, sagittate, the basal lobes rounded or slightly pointed; corolla pink; peduncles 6–12 cm. long, often exceeding the leaves.—Newfoundland, southern Quebec and Nova Scotia, south along the coast to Maryland and Virginia; also about the Great Lakes in Ontario, Michigan, Ohio, Indiana, Wisconsin and Minnesota. Representative specimens: NEWFOUNDLAND: Southeast Arm, Bonne Bay, Aug. 31, 1910, *Fernald & Wiegand*, no. 3,918. QUEBEC: Anticosti, Aug. 1, 1925, *Victorin, Germain & Marie*, no. 22,046. PRINCE EDWARD ISLAND: Indian River, Prince Co., Aug. 29, 1912, *Fernald, Long & St. John*, no. 7,954. NOVA SCOTIA: Eel Lake, Yarmouth Co., July 27, 1920, *Fernald, Bean & White*, no. 22,323. NEW BRUNSWICK: Bay du Vin Island, Sept. 18, 1913, *Blake*, no. 5,702. MAINE: Roque Bluffs, Washington Co., Aug. 11, 1907, *Cushman & Sanford*, no. 1,640. NEW HAMPSHIRE: Dover, Strafford Co., June 25, 1933, *Hodgdon*, no. 373. VERMONT: Rock Point, Burlington, July 12, 1894, *Eggleston*. MASSACHUSETTS: Oak Bluffs, Marthas' Vineyard, June 29, 1916, *Seymour*, no. 1,322. RHODE ISLAND: Block Island, Newport Co., Aug. 22, 1913, *Fernald, Hunnewell & Long*, no. 10,253. CONNECTICUT: Old Lyme, New London Co., June 13, 1912, *A. E. Blewitt*, no. 1,575. NEW YORK: Southampton, Long Island, Suffolk Co., July 25–Aug. 3, 1920, *H. St. John*, no. 2,887. NEW JERSEY: Milltown, May 1891, *Halsted*, no. 56. PENNSYLVANIA: Tinicum, Delaware Co., June 12, 1899, *A. MacElwee*, no. 526. DELAWARE: Oak Orchard, Sussex Co., Aug. 11, 1934, *Fernald & Long*, no. 4,148. MARYLAND: Havre de Grace, Aug. 3, 1923, *Tidestrom*, no. 11,590. VIRGINIA: Sea beach, Buckroe, May 16, 1912, *Robinson*, no. 357. ONTARIO: Tobermory, Bruce Co., July 3, 1933, *Krotkov*, no. 7,721. OHIO: Huron, Erie Co., Aug. 13, 1896, *E. L. Mosely*. MICHIGAN: Ann Arbor, Washtenaw Co., June

9, 1899, *S. H. Burnham.* INDIANA: East Chicago, Lake Co., June 24, 1920, *Peattie.* MINNESOTA: Swan Lake, Nicollet Co., June 1892, *C. A. Ballard.*

Choisy cited *C. repens* L. as a synonym of his var. *rosea* but this was an error and his varietal name cannot be used for the Linnaean plant. The type of *C. repens* L. is *Clayton*, no. 665, on which is written ". . . flore niveo, margine dilute rubente . . ." This is clearly not the plant which Choisy described with "corolla rosea ampla" and illustrated by reference to Bot. Mag. t. 732. Choisy's name is clearly referable to var. *americanus* Sims, not to *C. repens* L.

Although Sims' name has long been used for the common American plant (var. *communis*) his illustration shows the leaves sagittate, not hastate, and his name must be taken up for the sea-coast plant previously placed under var. *pubescens*.

Var. REPENS (L.) Gray, Syn. Fl. N. Am. **2**[1]: 215 (1878). PLATE 558, FIG. 8. *Convolvulus repens* L., Sp. Pl. 158 (1753). *Calystegia villosa* Raf., Fl. Ludov. (1817), ex char. *Convolvulus lactescens* Gronov. ex Choisy, in DC. Prod. **9**: 433 (1845), published in synonymy. *Calystegia sepium* (L.) R. Br. var. *repens* Gray, Man. Bot. 348 (1848). *Calystegia sepium* (L.) R. Br. var. *pubescens* Gray, Man. Bot. Ed. 5, 376 (1867). *Volvulus sepium* (L.) Junger var. *biangulo-sagittata* O. Ktze., Rev. Gen. **2**: 447 (1891). *Convolvulus sepium* L. var. *pubescens* (Gray) Fernald in RHODORA **10**: 55 (1908), as to name-bringing synonym. *Volvulus sepium* (L.) Junger var. *pubescens* (Gray) Farwell in Am. Midl. Nat. **12**: 130 (1930). *Convolvulus sepium* L. var. *Catesbeianus* (Pursh) Fernald, sensu Fernald in RHODORA **37**: 439 (1935).—Plant pubescent or essentially glabrous; leaves about 5–9 cm. long, 1.5–3 cm. wide, sagittate or sometimes hastate, the basal lobes rounded; corolla white or sometimes with a pink margin; peduncles usually 5–6 cm. long, not exceeding the leaves.—Primarily a Coastal Plain variety from Rhode Island to Florida, Alabama, Louisiana and Missouri, but also in the mountains of West Virginia. Representative specimens: RHODE ISLAND: Block Island, Newport Co., Sept. 14, 1913, *Fernald, Long & G. S. Torrey.* DISTRICT OF COLUMBIA: June 25, 1896, *E. S. Steele.* WEST VIRGINIA: Lost River, Hardy Co., Aug. 18, 1931, *E. L. Core*, no. 3,727. VIRGINIA: Jordan Point, Prince George Co., Aug. 16, 1938, *Fernald & Long*, no. 9,129, Sept. 16, 1938, no. 9,410. SOUTH CAROLINA: Morris Island, 1864, *Grosvenor.* GEORGIA: Darien, McIntosh Co., July 25, 1927, *Wiegand & Manning*, no. 2,639. FLORIDA: Jacksonville, April, *Curtiss*, no. 2,172. MISSOURI: St. Louis Co., July 1875, *H. Eggert.*

An extreme form in Florida which extends northward to South Carolina is f. **Nashii** (House), n. comb. (*Convolvulus Nashii* House in Muhl. **5**: 66 (1909)) with the leaf-blade very narrow, about 1 cm.

wide, usually densely pubescent and the basal lobes widely spreading. PLATE 558, FIG. 9. Representative specimens: FLORIDA: Eustis, Lake Co., March 12–31, 1894, *Nash*, no. 44, May 1–15, no. 609 (TYPE NUMBER).

Var. *pubescens* Gray was not clearly defined when published and the name has been used for the northern sea-coast plant (var. *americanus*). There is no specimen in the Gray Herbarium labeled var. *pubescens* by Gray but he placed his var. *pubescens* in synonymy under var. *repens* in the Synoptical Flora and, although his definition of var. *repens* was broader than that of Linnaeus, an examination of the specimens labeled var. *repens* by him shows them all to be the southern plant described by Linnaeus. Since he had these specimens before him when he reduced var. *pubescens* to a synonym of var. *repens*, it is only logical to consider the former name as a synonym of the latter.

The type of *Volvulus sepium* (L.) Junger var. *biangulo-sagittata* O. Ktze. has been examined, through the courtesy of Dr. Gleason, and clearly belongs under var. *repens* (L.) Gray.

Var. FRATERNIFLORUS Mack. & Bush, Man. Fl. Jackson Co., Mo. 153 (1902). PLATE 558, FIGS. 4–6. *Convolvulus fraterniflorus* (Mack. & Bush) Mack. & Bush in Rep. Mo. Bot. Gard. **16**: 104 (1905).—Plant pubescent or essentially glabrous; leaves about 3–9 cm. long, 2–5 cm. wide, hastate, the basal lobes angled; corolla white; peduncles about 4–8 cm. long, usually exceeding the petioles but rarely the leaves.—Illinois to Montana, south to Arkansas and New Mexico. Representative specimens: ILLINOIS: Peoria, July 1903, *F. E. McDonald*. IOWA: Ames, July 1909, *Campbell*, no. 43. MISSOURI: Martin City, June 28, 1905, *Bush*, no. 3,037 (type locality). ARKANSAS: northwestern Ark., July, *F. L. Hawey*, no. 119. NORTH DAKOTA: Fargo, Aug. 23, 1901, *Waldron & Manns*. KANSAS: Rieley Co., June 18, 1895, *J. B. Norton*, no. 353. MONTANA: Gallatin Co., Aug. 5, 1901, *W. W. Jones*. COLORADO: New Windsor, Weld Co., July 31, 1906, *Osterhout*, no. 3,456. NEW MEXICO: Las Vegas, July 1881, *G. R. Vasey*.

Mackenzie and Bush described var. *fraterniflorus* from Missouri as a pubescent plant with large bracts and usua ly paired flowers. However, their material is only a small part of a larger, white-flowered series, growing throughout the Prairie and Great Plain regions.

EXPLANATION OF PLATES 557 AND 558

PLATE 557. CONVOLVULUS SPITHAMAEUS L.: FIG. 1, plant, × ⅔, (TYPE); FIG. 2, plant, × ½ from Ontario.

Var. CATESBEIANUS (Pursh) Tryon: FIG. 3, plant, × ½ (TYPE).

PLATE 558. CONVOLVULUS SEPIUM L. (typical): FIG. 7, leaf and flower, × ⅓, from England.

Var. COMMUNIS Tryon: FIGS. 1–2, leaf and flower, × ½, from TYPE.
Var. AMERICANUS Sims: FIG. 3, plant, × ⅓.
Var. FRATERNIFLORUS Mack. & Bush. FIGS. 4–6: FIGS. 4–5, leaf and flower, × ⅓, from Fargo, North Dakota; FIG. 6, leaf and flower, × ⅓, from Martin City, Missouri (TYPE LOCALITY).
Var. REPENS (L.) Gray: FIG. 8, plant, × ½ (TYPE).
Var. REPENS (L.) Gray f. NASHII (House) Tryon: FIG. 9, leaf, × ¾.

IV. NEW SPECIES, VARIETIES AND TRANSFERS

M. L. FERNALD

(Plates 559–569)

IN THE COURSE of studies on the flora of the northeastern United States and adjacent Canada and Newfoundland numerous items have accumulated which need discussion or clarification. In so far as they are in form for publication they are here presented.

CYPERUS DIANDRUS Torr., forma **elongatus** (Britton), comb. nov. *C. diandrus*, var. *elongatus* Britton in Bull. Torr. Bot. Cl. xix. 226 (1892).

Typical *Cyperus diandrus* has the spikelets 6–32-flowered and 0.4–1.8 cm. long. Forma *elongatus*, which is scattered throughout the range of the typical form, has them much elongate (as in many species of the tribe), 40–50-flowered and 2–2.5 cm. long.

ARUNCUS **dioicus** (Walt.) comb. nov. *Actaea dioica* Walt. Fl. Carol. 152 (1788). *Aruncus allegheniensis* Rydb. in N. Am. Fl. xxii³. 256 (1908); Fernald in RHODORA, xxxviii. 180, t. 416, figs. 1, 2, 5 and 8 (1936).

A. DIOICUS, var. **pubescens** (Rydb.) comb. nov. *A. pubescens* Rydb. in N. Am. Fl. xxii³. 256 (1908). *A. allegheniensis* Rydb., var. *pubescens* (Rydb.) Fernald in RHODORA, xxxviii. 179, t. 416, fig. 4 (1936).

In 1936 I published photographs showing how the eastern North American *Aruncus* differs in details of flowers and fruits from the Old World *A. sylvester* Kostel. (1844); and I took up the name *A. allegheniensis* Rydb. (1908) for our plant. I then overlooked, as had Rydberg, the very early description of the Carolinian plant by Walter (June, 1788). *Aruncus* as a genus, rests upon the Old World *Spiraea Aruncus* L. and under the latter name the eastern American plant was known until the recent general acceptance of the genus *Aruncus*. *Aruncus* of the *Rosaceae* superficially resembles *Astilbe* of the *Saxifragaceae* and the two are frequently misidentified; *Astilbe* has perfect flowers,

Aruncus is dioecious. Walter's *Actaea dioica* was unusually well described:

> *dioica* 3. floribus paniculatis; corollis 4 ad 6 petalis viridescentibus; pericarpiis 5 ad 15 monospermis; foliis triternatis, foliolis obovatis lobatis integrisque; caulibus suffruticosis.

In February, 1839, Asa Gray, studying Walter's herbarium, made the memorandum: "*Actaea dioica!* = Spiraea Aruncus." Gray, maintaining our plant as *Spiraea Aruncus* L. and, subsequently, following the sensible, therefore discarded Kew rule, called it *Aruncus sylvester*. It is natural, therefore, that in Gray's own work Walter's name got overlooked. Some European and Asiatic botanists treat *Aruncus* as a variable circumboreal monotype. It should be noted that for the aggregate species of such authors the name *Aruncus dioicus*, based on a Walter name of 1788, has priority over all others yet brought forward.

ILEX MONTANA AND I. DUBIA (PLATE 559). In 1848, in the 1st edition of his Manual, Asa Gray published the new species *Ilex montana* Torr. & Gray in Gray, Man. 276 (1848). There already existed a *Prinos montanus* Swartz, Prodr. 58 (1788) and Gray, in 1856, thinking apparently of the specific rather than the generic name, changed his *I. montana* to *I. monticola* Gray, Man. ed. 2: 264 (1856), a substitute for "I. montàna, *ed.* 1, not Prinos montanus, *Sw.*" Of course, by present rules of nomenclature the original *Ilex montana* Torr. & Gray (1848) was the valid name, since there existed no other identical combination. But the suggestion once started, that there was perhaps something not quite regular in the nomenclatural situation, error after error has followed. It was not until thirteen years after the first and wholly correct publication of the combination *Ilex montana* (1848) that *Prinos montanus* Sw. was transferred to *Ilex*, and then by the barest technicality: "ILEX MONTANA, Griseb.—Syn. *Prinos montanus* et *P. sideroxyloides*, Sw.," published by Grisebach in Mem. Am. Acad. n. s. viii. (Plantae Wrightianae), 171 (1861); by a bare technicality because *P. montanus* and *P. sideroxyloides* are not conspecific. Nevertheless, following the example of Asa Gray, who threw aside the wholly right *I. montana* (1848) on account of Swartz's *Prinos montanus*, succeeding authors have mostly assumed that the Grisebach binomial of 1861 has priority over that of Torrey & Gray in 1848! In 1890, to be sure, Britton used the name correctly when he published *I. montana* T. & G., var. *mollis* (Gray) Britton in Bull. Torr. Bot. Cl. xvii. 313 (1890), based on *I. mollis* Gray (1867). For some reason, however, he

promptly abandoned the correct specific name and in 1894, in Mem. Torr. Bot. Cl. v. 217 (1894), took up *I. monticola* Gray (1856) with the synonym "*I. montana* T. & G.; A. Gray, Man. 276 (1848), not Griseb."; but in 1913 he returned, correctly it seems to me, to *I. montana*, in Ill. Fl. ed. 2, ii. 488 (1913). Trelease and some other American authors have also assumed the priority of Grisebach's combination. *Index Kewensis* did not catch the original *I. montana* T. & G. (1848) and gave only that of Grisebach (1861); furthermore it listed as maintained both *I. monticola* Tul. (1857) and *I. monticola* Gray, but started the latter from Gray, Man. ed. 5: 306 (1867), instead of from ed. 2: 264 (1856). Thus, if *Index Kewensis* is taken as the guide in these instances, both *I. montana* Griseb. and *I. monticola* Tul. have right-of-way, whereas they are both later homonyms. For the large-leaved and large-fruited shrub of the Blue Ridge and the Alleghenies the name *I. montana* Torr. & Gray is apparently correct.

Another series of errors started with the citation in the original publication of *Ilex mollis* Gray of the synonym "P[rinos]. ambiguus *Pursh*, not *Michx.*"; and by Trelease in Gray's Synoptical Flora, i. 390, of the citation under the same species, of *I. dubia* (G. Don) BSP., based on *P. dubius* G. Don. The citation of *P. ambiguus* would now be more correctly SENSU Pursh, not Michx. As to *P. dubius* the case seems in some ways clear; in others it is both dubious and ambiguous. The name *Prinos ambiguus* started in Michaux, Fl. Bor.-Am. ii. 236 (1803), for the small-leaved southern shrub, called *I. ambigua* (Michx.) Chapm. by Trelease and by Small, although, as shown by Rehder in Journ. Arn. Arboret. iii. 214 (1922), *I. ambigua* (Michx.) Chapm. must give way to *I. caroliniana* (Walt.) Trel. in Trans. Acad. Sci. St. Louis, v. 347 (1889), which rests on *Cassine caroliniana* Walt. Fl. Carol. 242 (1788). Michaux, who suggested similarity of his species to *Cassine caroliniana* Walt., described it as follows:

> AMBIGUUS. P. foliis ovalibus, utrinque acuminatis; pedicellis masc. 1-floris, ad imos ramunculos numerose congestis; foem. solitariis: florum partitione quaternaria.
>
> *Obs.* Interdum florum partitio quinaria; tunc videtur CASSINE *caroliniana*. WALTERI. Certo tamen *P. verticillati* LINN. congener.
>
> *Hab.* in Carolina.

Pursh somewhat altered the description to cover a different species and extended the range north to New Jersey, where *Prinos ambiguus* Michaux is unknown. Pursh's account was as follows:

ambiguus. 2. P. foliis deciduis ovalibus utrinque acuminatis mucronato-serrulatis subtus pubescentibus, floribus 4–5-fidis, masculis ad imos ramulos congestis, foemineis solitariis.—*Mich. fl. amer.* 2. *p.* 236.
Cassine caroliniana. *Walt. fl. car.* 242.
In sandy wet woods and on the borders of swamps: New Jersey to Carolina. ♄ . July, Aug. *v. v.* Flowers white; berries red, larger than No. 1. [*P. verticillatus.*][1]

Obviously Pursh added something quite extraneous to the original *Prinos ambiguus* Michaux; but he was not intentionally publishing a new species. He definitely ascribed it to Michaux, and the Pursh amplification should, as already stated, be cited: *P. ambiguus* SENSU Pursh, not Michx. George Don, presumably not knowing either the shrub of Michaux or of Pursh, literally translated into English the account of Pursh, even to "in sandy woods, and on the borders of swamps, from New Jersey to Carolina," and appropriately renamed this shrub, which he probably did not know, *Prinos dubius* G. Don, Gen. Syst. Gard. Bot. ii. 20 (1832). In 1888, Britton, Stern & Poggenburg transferred *P. dubius* to *Ilex*, without a word of discussion, and with as little bibliographic citation as was given by Grisebach in publishing his *I. montana* (Sw.) Griseb., barely enough, presupposing a foregiving botanical public, to get by: Ilex "dubia, (Don). (*I. mollis, Gray.*)," BSP., Prelim. Cat. Anthoph. Pteridoph. N. Y. 11 (1888). Shortly thereafter Dr. Britton, rightly as it seems to me, discarded the name *I. dubia* for *I. mollis* and published *I. montana* T. & G., var. *mollis* (Gray) Britton in Bull. Torr. Bot. Cl. xvii. (1890).

Ilex montana (including *I. mollis* and *I. monticola*) is a small tree or large shrub of upland woods along the mountains from western New England and the uplands of New York southward. The range and habitat given by Britton is "Mountain woods, New York and Pennsylvania to Georgia and Alabama. Mountain holly." (Ill. Fl. ed. 2, ii. 489); Small (Man. 815), calling it "Mountain Holly," says, "Woods, especially mountain slopes, Blue Ridge and more northern provinces, Ga. and Ala. to N. Y."; Taylor (Fl. Vic. N. Y.) has it "In mountain woods" and cites New Jersey material only from the upland of Sussex and Morris Counties; House (Annot. List N. Y., 480), correctly taking up *I. montana*, says "In mountainous woods"; and so does Porter (Fl. Penn. 203); and the most northeasterly stations for the species are "on the summit of The Dome and about Plantin Pond, Mt. Wash-

[1] Pursh, Fl. Am. Sept. i. 220 (1814).

ington," Berkshire County, Massachusetts (Hoffmann, Fl. Berks. Co. 296). It, therefore, seemed quite improbable that the shrub described by Pursh from "sandy wet woods and on the borders of swamps: New Jersey to Carolina," and thought by him to be the small-leaved *Prinos ambiguus* of Michaux, could have anything to do with the Large-leaved or Mountain Holly, *Ilex montana* Torr. & Gray, of upland woods of the Blue Ridge and the Alleghenies. It seemed evident that, in taking up in place of the clearly typified *I. montana* the wholly indefinite and heretofore unidentified *I. dubia*, Loesener, Mon. Aquifol. (Nov. Act. Abh. k. Leop.-Carol. Deutsch Akad. Naturforscher, lxxviii), 484 (1901) and those who follow him have not understood what Pursh had before him. Since the fullest representation of Pursh's types is in the remarkable collection which had belonged to Benjamin Smith Barton and then to the American Philosophical Society (the collection now deposited at the Academy of Natural Sciences of Philadelphia), I sought there, with the aid of Dr. Pennell and Mr. Long. The species of *Prinos* treated by Pursh, including the type of his *P. laevigatus* (correctly interpreted) are well accounted for by good specimens with Pursh's own labels. There is, however, nothing called by him *P. ambiguus;* but a very full and beautiful sheet in staminate flower (our FIG. 1) bears in his hand an unpublished new name; and in all details, "foliis deciduis ovalibus utrinque acuminatis mucronato-serrulatis subtus pubescentibus, floribus 4–5-fidis, masculis ad imos ramulos congestis," it beautifully checks with the Pursh diagnosis of *P. ambiguus* sensu Pursh, not Michx. That it truly represents what Pursh described, though no fruit is now preserved, there can be no question. The specimen was from the Bartram Garden, the shrubs originally found by Bartram on the Meherrin River, which he crossed above Emporia in Virginia. Dr. Pennell has most kindly allowed me to reproduce a portion of it, × 1, as PLATE 559, FIG. 1. FIG. 2 shows the under surface of a leaf, × 10, to indicate the pubescence; FIG. 3 is from an isotype, × 1, of *Ilex Amelanchier* M. A. Curtis; FIG. 4, the lower surface, × 10, of a leaf of the latter. That they are the same species is evident. Barton presented a small fragment of the Pursh type to Asa Gray. This fragment, without further elucidation than a note by Gray, "Pursh, Hb. Barton" is mounted beside the isotype of *I. Amelanchier* in the Gray Herbarium and it bears the Synoptical Flora revision-slip marked by Trelease "*Ilex Amelanchier.*" Evidently neither Gray nor Trelease recognized its full significance.

Very briefly the tangled nomenclature of *Ilex montana* and of *I. dubia* follows.

ILEX MONTANA Torr. & Gray in Gray, Man. 276 (1848), not *I. montana* (Sw.) Griseb. (1861). *I. ambigua* sensu Torr. Fl. N. Y. ii. 2 (1843), not *Prinos ambiguus* Michx. (1803), source of the name. *Prinos ambiguus* sensu Wood, Class-Book, pt. ii. 243 (1845), not Michx. (1803), obviously, from the description, based on *Ilex ambigua* sensu Torr., although the latter not cited. *I. monticola* Gray, Man. ed. 2: 264 (1856), illegitimate (substitute) name, not *I. monticola* Tul. (1857). *I. Amelanchier* β. *monticola* Wood, Am. Bot. Fl. 208 (1870), obviously, from the description, based on *I. monticola* Gray, although the latter not cited. *I. dubia*, var. *monticola* (Gray) Loesener, Mon. Aquifol. (Nov. Act. Abh. k. Leop.-Carol. Deutsch Akad. Naturforscher, lxxviii), 485 (1901).

Var. MOLLIS (Gray) Britton in Bull. Torr. Bot. Cl. xvii. 313 (1890). *I. mollis* Gray, Man. ed. 5: 306 (1867) as to type (*Lowrie*) and descr., excl. synonyms. *I. dubia* sensu Trelease ex Loesener in Koehne, Deutsche Dendrol. 371 (1893) and in Loesener, Mon. Aquifol. 484 (1901), not *I. dubia* (G. Don) BSP. (1888). *I. monticola mollis* (Gray) Britton in Mem. Torr. Bot. Cl. v. 217 (1894). *I. dubia*, var. *mollis* (Gray) Loesener, l.c. 486 (1901) and var. *mollis* forma *Grayana* Loesener, l. c. 487 (1901).

Var. **Beadlei** (Ashe), comb. nov. *I. Beadlei* Ashe in Bot. Gaz. xxiv. 377 (1897). *I. dubia*, var. *mollis*, forma *Beadlei* (Ashe) Loesener, l. c. 487 (1901). *I. dubia*, var. *Beadlei* (Ashe) Rehder, Man. Cult. Trees and Shrubs, 546 (1927), wrongly ascribed to Loesener.

Var. **macropoda** (Miq.), comb. nov. *I. macropoda* Miq. Prol. Fl. Jap. in Ann. Mus. Bot. Lugd.-Bat. iii. 105 (1867). *I. dubia*, var. *macropoda* (Miq.) Loesener, l. c. 487 (1901).

Var. **hupehensis** (Loesener), comb. nov. *I. dubia*, var. *Hupehensis* Loesener, l. c. 488 (1901).

I. DUBIA (G. Don) Britton, Stern & Poggenburg, Prelim. Cat. Anthoph. Pteridoph. N. Y. 11 (1888); Trelease ex Loesener in Koehne, Deutsche Dendrol. 371 (1893) as to source of name. *Prinos ambiguus* sensu Pursh, Fl. Am. Sept. i. 220 (1814), not Michx. *P. dubius* G. Don, Gen. Syst. Gard. Bot. ii. 20 (1832), renaming of *P. ambiguus* sensu Pursh, therefore based on the Pursh type. *I. Amelanchier* M. A. Curtis in Chapm. Fl. So. U. S. 270 (1865). *Prinos corymbosus* Pursh "Herb. Barton. mss. ex Sargent," Loesener, Mon. Aquifol. 489 (1901), in synonymy.

The last name, published in synonymy, is similar to but not quite identical with the unpublished trivial "*corymbulosus*," written by Pursh on the label of his material in Barton's herbarium. As already explained, it is evident that, after writing the diagnosis of his new species under the unpublished name, Pursh (or his editors) dropped

the name and erroneously took up *P. ambiguus* Michx. Thus the doubt and ambiguity started and the name given by George Don to the Pursh plant was almost prophetic in its meaning.

PARTHENOCISSUS QUINQUEFOLIA (L.) Planch., forma **hirsuta** (Donn), comb. nov. *Ampelopsis hirsuta* Donn, Hort. Cantab. 166 (1796), *nomen nudum;* Roem. & Schultes, Syst. v. 321 (1819). *Cissus hederacea,* β. *hirsuta* (Donn) Pursh, Fl. Am. Sept. i. 170 (1814). *Quiniaria hirsuta* (Donn) Raf. Am. Man. Grape Vines, 6 (1830). *Ampelopsis quinquefolia,* β. *hirsuta* (Donn) Torr. & Gray, Fl. i. 245 (1838). *P. quinquefolia,* var. β. *hirsuta* (Donn) Planch. in DC. Monogr. v². 449 (1887), erroneously ascribed to Torr. & Gray. *P. hirsuta* (Donn) Small, Fl. Se. U. S. 758 (1903), not Planch. (1900). *Psedera hirsuta* (Donn) Greene, Leafl. Bot. Obs. i. 220 (1906). *Psedera quinquefolia,* var. *hirsuta* (Donn) Rehder in RHODORA, x. 26 (1908).

Although Donn (who did not describe the plant), Roemer & Schultes (who took their description from Pursh), Rafinesque, Small, Greene and Rydberg (in his Flora of Prairies and Plains) maintain, merely because of some pubescence on the foliage, *Parthenocissus hirsuta* as a species, I agree with the conclusion of the late Eugene P. Bicknell: "as to the pubescent . . . plant there seems little reason to doubt that it is merely a condition of the common Virginia creeper."[1] When he transferred it, as a variety, to *Psedera quinquefolia,* as var. *hirsuta,* Rehder gave it a restricted western range, "from Ontario (Dr. Wm. Macoun, orally) through western New England and along the western slope of the Alleghany mountains through New Mexico to Mexico. In the North this variety very rarely flowers and fruits, which suggests that it is not at home there."[2] My own experience and that of some others who have watched the plants indicates that the pubescent form is most apt to be in shadier and damper habitats than the glabrous and more fruitful plant; and Bicknell, in the place cited, went even further, saying: "The leaves of young plants are often very pubescent, and in older plants the lower leaves may be pubescent and the later ones quite glabrous". Bicknell's notes were made on Nantucket Island where the plant is fertile; flowering or fruiting specimens of it are also before me from Vermont, from Martha's Vineyard, from Connecticut and from New York. These are all from near the northeastern limit of the species, and Nantucket and Martha's Vineyard are as far east as any stations known for the glabrous plant, while material in the Gray Herbarium from Kenesaw Mountain, Georgia,

[1] Bicknell in Bull. Torr. Bot. Cl. xl. 607 (1913).
[2] Rehder in RHODORA, x. 26 (1910).

is from well to the southeast of the "western slope of the Alleghany mountains." In other words, the pubescent plant may occur almost anywhere through the range of the glabrous one.

Parthenocissus quinquefolia is essentially a southern species, common in the southern United States and extending northward to southwestern Maine, southern New Hampshire, Vermont, New York, Indiana, Illinois and Iowa. There is no material of it in the Gray Herbarium from Canada, where it is wholly or chiefly replaced by the northern and western *P. vitacea* (Knerr) Hitchc. All material of the genus which I have seen from Quebec, Prince Edward Island, New Brunswick, Nova Scotia and Ontario belongs to the latter species. It is, therefore, important to consider for a moment the facts that the basic *Hedera quinquefolia* L. Sp. Pl. i. 202 (1753) apparently drew its trivial name from *Edera quinquefolia canadensis*, Cornut, Can. Pl. 99, t. 100 (1635) and that by Linnaeus the species was assigned the unequivocal "*Habitat in* Canada." From this habitat one might infer that the Linnean plant was the Canadian *Parthenocissus vitacea*. It should be borne in mind, however, that Linnaeus gave five other references, including Gronovius (who could have had only the southern species) and that his diagnosis was derived from Mitchell; furthermore, the Cornut plate shows an exaggerated number of adhesive disks on the tendril-branches and his description specially mentions them. It is probable, then, that Cornut's plant was wrongly ascribed a Canadian origin. With the vague geographic concepts of his time Cornut included in his book plants of Spain, Greece, India and other Old or New World areas. Unless his descriptions and illustrations are definitely of known Canadian species it is unsafe to assume that they were based on Canadian plants. The name *Parthenocissus quinquefolia* may safely be left to the species with abundant adhesive disks, paniculately clustered cymes with solitary lower branches, and relatively small fruits.

As to the nomenclatural basis of forma *hirsuta*, Pursh, in first describing it, took up the name used without definition by Donn; so did Roemer & Schultes in publishing *Ampelopsis hirsuta*. Donn's name was thus validated and Donn should be cited parenthetically.

PARTHENOCISSUS VITACEA (Knerr) Hitchc., forma **dubia** (Rehder), comb. nov. *P. hirsuta* Graebner in Gartenfl. xlix. 249 (1900), not *P. hirsuta* (Donn) Small (1903), later homonym—see synonymy above. *P. vitacea*, var. *dubia* Rehder in Mitt. Deutsch. Dendr. Ges. xiv. 135

(1905). *Psedera vitacea*, var. *dubia* (Rehder) Rehder in RHODORA, x. 28 (1908).

VITIS LABRUSCA L., forma **alba** (Prince), comb. nov. Var. *alba* Prince, Treatise on the Vine, 181 (1830).

The form with very pale fruit, either white with amber or russet tone or pinkish.

VITIS RUPESTRIS Scheele, forma **dissecta** (Eggert), comb. nov. Var. *dissecta* Eggert ex Bailey in Gray, Syn. Fl. N. Am. i. 422 (1897).

VITIS RIPARIA Michx., var. **syrticola** (Fernald & Wiegand), comb. nov. *V. vulpina*, var. *syrticola* Fernald & Wiegand in RHODORA, XXV. 212 (1923).

The name *Vitis riparia* Michaux, for the common Riverbank or Frost Grape, with long porrect and acuminate leaf-lobes, small acid fruits with a heavy bloom, and very thin diaphragms at the stem-nodes was correctly applied by DeCandolle, Torrey, Torrey & Gray and Emerson, and by Gray (as a species or as *V. cordifolia*, var. *riparia*) in the first five editions of the *Manual*, by Watson in the 6th edition and by Planchon and numerous other students of our grapes. The name *V. vulpina* L., on the other hand, was as regularly misapplied for many years to the southern *V. rotundifolia* Michx. (the Muscadine).

That the name *Vitis vulpina*, like most Linnean names resting partly on material well known to Linnaeus at first hand, partly on literary references and specimens not so clearly understood by him, does not apply to *V. rotundifolia* everyone is now agreed. In recent years, unjustifiably as it will appear, it has been applied to the northern and almost transcontinental and western *V. riparia* Michx. In June, 1893, Professor L. H. Bailey published a letter from the late Dr. N. L. Britton which included the following item on the Linnean herbarium:

> "*Vitis vulpina*, Linn.—Flowering specimens from the Upsala [Sweden] garden and leaves from Kalm. Planchon correctly refers them to the *V. riparia*, Michx., the type of which is in Michaux' herbarium at Paris, and is correctly understood as the common river-bank grape."[1]

That would seem to be conclusive; and Bailey forthwith regularly reduced *Vitis riparia* Michx. to *V. vulpina* L., in Gray's Synoptical Flora and elsewhere. But in 1898 Bailey wrote:

> "Since that time, however, I have myself examined Linnaeus' specimens in London, and find that he had specimens of two species under the name of vulpina. On one sheet are two leaves, one marked *V. vinifera*

[1] Britton as quoted by Bailey in Am. Gard. xiv. 353 (June, 1893).

and the other *V. vulpina*, both in Linnaeus' hand. The former is the wine-grape (*V. vinifera*), and the latter is the river-bank grape (*V. riparia*). Another herbarium sheet, however, has a large flowering specimen, labelled, in Linnaeus' hand, *V. vulpina*, and this is the frost-grape (*V. cordifolia*). It would have been better to have taken this latter specimen as Linnaeus' type, and to have made the name vulpina supplant cordifolia; but since the other disposition has been made of the case, I shall not make the change."[1]

In March, 1934, Bailey quoted his statement just given and added:

"My opinion still holds that the specimen represents the winter grape (*V. cordifolia*) although a new examination of the specimen itself might afford additional clues. . . The Linnaean sheet identified as *cordifolia* is inscribed by Linnaeus with the name *vulpina* and the numeral 4 that refers to the entry in Species Plantarum. Rules of nomenclature adopted since the foregoing publications require, on the face of the record, that *vulpina* supplant *cordifolia*, in which case *riparia* comes up for the plant now known as *vulpina* or frost grape; the net gain would be confusion. But the case is not as simple as this.

As one looks at the Linnaean account in Species Plantarum one is struck by the fact that *Vitis vulpina* is not described, but is attended with the phrase "foliis cordatis dentato-serratis utrinque nudis"; then is cited "Vitis vulpina dicta virginiana nigra" from Plukenet, Almagestum, 1696; apparently Linnaeus took the name *vulpina* from Plukenet. The Latin line precludes *V. Labrusca*, *aestivalis*, and its relatives, and it leaves only the frost grape and winter grape and the muscadine among Virginian species to qualify for the name. Linnaeus cites no collector; yet the sheet bears the letter K which means Kalm, who collected in Canada, New York, New Jersey and Pennsylvania, whereas Linnaeus ascribes vulpina to Virginia (and he would hardly have used the term "Virginia" as broadly as to include New Jersey and Pennsylvania), and also H. U. which means the garden or hortus at Upsala. The word *fox* (*vulpina*) does not aid us in identifying the Plukenet grape for at that time it may have been applied to more than one species and not alone to *V. Labrusca* as at present as, indeed, is done by Plukenet himself; in fact, the muscadine (*V. rotundifolia*) was once known as fox grape.[2]

The Linnaean sheet bears two specimens, the lower one of three leaves apparently from the wild and collected by Kalm, the upper one of three[3] leaves and two flower-clusters being grown at Upsala from Kalm seeds. The Linnaean sheet of *Vitis Labrusca* is also marked with a K, showing that Peter Kalm collected it; and in this case, as we have seen, the species is supported by the picture (Fig. 98) in Plukenet, but we have no cited figure back of *V. vulpina*.

It is apparent that Linnaeus meant to designate two American grapes, one species (*Labrusca*) with tomentose leaves, and the other (*vulpina*) with naked leaves. We have noted (page 186) that his *Labrusca* appar-

[1] Bailey, Evolution of Our Native Fruits, 103 (1898).

[2] In July, botanizing with two experienced amateurs of Norfolk, Virginia, we came to *V. vulpina* (*V. cordifolia*) on the outermost coast of Virginia (Back Bay). Looking at it they immediately exclaimed "Fox Grape!"—M. L. F.

[3] The photograph shows only 2.

Photo. W. H. Hodge

ILEX DUBIA: FIG. 1, TYPE, × 1 (courtesy of Dr. FRANCIS W. PENNELL); FIG. 2, lower surface of leaf, × 10; FIG. 3, leaf, × 1, from ISOTYPE of *I. Amelanchier;* FIG. 4, lower surface of leaf shown in FIG. 3, × 10.

Type-sheet of VITIS VULPINA, × ½ (courtesy of Mr. S. SAVAGE).

ently included *aestivalis*, and his *vulpina* is undoubtedly also to be considered an aggregate species and one therefore has considerable latitude in interpretation of it. If there is extant an authentic Plukenet specimen of his "Virginian nigra" it might either change the application of *V. vulpina* or eliminate it as a *nomen confusum*.[1]

In view of the simple facts, that in preparing *Species Plantarum* Linnaeus had in his own herbarium and himself labeled two sheets bearing what he called *Vitis vulpina* and described the fuller of them in the very typical Linnean diagnosis (although Bailey says "not described"), the earlier references are wholly secondary in a nomenclature which avowedly and actually begins with 1753. Obviously, as Professor Bailey correctly concluded, the full sheet bearing above a flowering branch from the Upsala garden ("H.U." below the specimen indicating Hortus Upsaliensis) should stand as the type of *V. vulpina*. Plate 560 shows this sheet, × ½, and probably every botanist who knows the southern *V. cordifolia* will agree with Bailey that the type of *V. vulpina* L. is *V. cordifolia* Michx. Bailey protests the ascription by Linnaeus of a plant supposedly originating from Kalm's collections to Virginia; but when Linnaeus got a *Potentilla* from Hudson Bay and named it *P. pensylvanica* and a *Berberis* from the South and called it *B. canadensis*, it is evident that he had no clearer conception of American geography than do most present-day European botanists and little appreciation of the geographic significances of the names he repeatedly used; it sometimes seems as if he had a small series and used at random such trivials as *canadensis, marilandica, pensylvanica* and *virginiana*. At any rate, Kalm spent much time within the range of true *V. vulpina* (*V. cordifolia*), which occurs in northern Delaware, southern New Jersey and eastern Pennsylvania. It would have been very difficult for him not to see it.

Although Bailey has said that from a correction of the error to which he clings "the net gain would be confusion," it can not be overlooked that the confusion would be only temporary and that long prior to his misapplying the name *Vitis vulpina* L. to *V. riparia* Michx., instead of to *V. cordifolia* Michx., the Linnean name had been correctly used for *V. cordifolia* by several early botanists: by Muhlenberg[2] who definitely reduced *V. cordifolia* to its synonymy; by Torrey, who did the same[3]; by Beck, Le Conte and several others. In fact, if there

[1] Bailey, Gent. Herb. iii. fasc. iv. 236 (1934).
[2] Muhl. Cat. 27 (1813).
[3] Torr. Fl. N. Mid. U. S. 264 (1824).

were any question about the identity of *V. vulpina* and *V. cordifolia* it was very clearly settled by the distinguished botanist who bought the Linnean collections and established them in London. In 1819 Sir James Edward Smith, treating *Vitis* in Rees' Cyclopedia (xxxvii.) correctly applied the name *V. riparia* Michx. to the "Sweet-scented Vine," with "leaves unequally and deeply toothed, slightly three-lobed." He also correctly described *V. vulpina* L., with the synonym *V. cordifolia* Michx., the "Winter Grape, or Chicken Grape"; and, from his study of the Linnean material which he had purchased, explicitly said: "This is certainly the *vulpina* of Linnaeus, and consequently of Willdenow, though Pursh cites the latter author under the foregoing species [*V. aestivalis*]. The *leaves* of the present have but a slight indication of a lobe at each side, and are more oblong and pointed than either of the two last [*V. Labrusca* and *V. aestivalis*]; being moreover quite smooth, from the earliest period, except the little axillary tufts of hair on the under side."[1] See PL. 560.

Sir James Edward Smith and several others of his time had the identities correct and Smith's correct typification of 1819 antedates the erroneous one by three-fourths of a century. By our rules of nomenclature (I do not get the full significance of Bailey's reference to "Rules of nomenclature adopted since the foregoing publication") Smith's typification, having no flaw in it, properly stands. The present-day temporary confusion is wholly secondary to the correct typification established 120 years ago!

VITIS ARANEOSA Le Conte.—In 1853 John Le Conte published as new species of the southeastern states four members of *Vitis*. One of them, *V. araneosa* Le Conte in Proc. Acad. Philad. 1852–53: 272 (1853), seemed, in its "berries of a middling size, .5 of an inch in diameter, black," so distinct from ordinary *V. aestivalis* Michx. to which Bailey (Gent. Herb. iii.[4] 154) reduces it and which he describes as having "berries . . . with medium to thick bloom," that I took to Philadelphia a representative series of the rufescent-leaved species for comparison with it. Le Conte's account was as follows:

[1] At the Aberdeen meeting of the British Association in September, 1885, Radlkofer thus referred to Smith's elucidation of the Linnean species: "As far as the Linnean Herbarium is concerned, Sir Edward Smith in his day endeavoured to extract therefrom a correct conception of the Linnean species; but the slender scientific means of his time enabled him to arrive at the goal in only a few instances. Nevertheless his contributions to Rees's 'Cyclopaedia' on this subject are of great value, and deserve republication in a collective form, in order to make them generally available."—Radlkofer in Rep. Fifty-first Meeting Brit. Assoc. Adv. Sci. 1080 (1886).

6. V. ARANEOSUS. Foliis lato-cordatis, sublobato-angulatis, integris, trilobis aut quinquelobis, lobis acuminatis, dentatis, dentibus submucronatis, supra glabris, subtus arachnoideo-villosis, villositate plus minus ferruginea. Racemis subdensis, baccis maioribus nigris.

Hab.—In the upper parts of Georgia. Vulg. Fox grape.

Stem moderately large and high. Leaves broad, cordate, sublobately angled, entire and three or five-lobed, acuminate dentate; the teeth submucronate, above glabrous, beneath arachnoideo-villous, more or less ferruginous; in the older leaves this villosity forms into small tufts or knots, and in the very oldest almost entirely vanishes, although in the youngest it is very thick and close. Racemes dense; berries of a middling size, .5 of an inch in diameter, black, often very sweet and agreeable. The leaves are sometimes 8 inches long and as many wide.

The species is well worth cultivating.

Whereas three of Le Conte's four newly proposed species were from New Jersey, from "Carolina and Georgia in swamps," and from "Virginia and Maryland," respectively, *Vitis arancosa*, with black berries half-an-inch in diameter, came from "the upper parts of Georgia," where it is called "Fox grape." One of the several folders of loose leaves and branchlets in the Le Conte series contains small and medium-sized leaves as described by Le Conte and at least one to support the "sometimes 8 inches long and as many wide" of his account. This folder has the accompanying label:

(3) From Dr. Ware's gardens at Athens [upper Georgia], Sept. 14th, 1850. Supposed to be the Wild Fox or Winter Grape. Fruit in very compact bunches or clusters; tolerably pleasant to the taste; not very sour. Color = black. Size = [a circle ½ in. across].

That this sheaf of specimens, the only ones from upper Georgia and closely matching the original account of *Vitis araneosa*, should be accepted as the type-material of that species there seems no reasonable doubt. It is, therefore, significant that it is closely matched by an isotype of *V. rufotomentosa* Small, Fl. Se. U. S. 756, 1334 (1903) and quite as well by material from upper Georgia (Kenesaw Mt., *Perry & Myers*, no. 935) which Professor Bailey has correctly marked *V. rufotomentosa.* The latter species, originally described by Small with "berries black, with little or no bloom," is, it seems to me, inseparable from *V. arancosa* Le Conte (1853) and must take the latter name, *V. arancosa* Miquel from Sumatra dating from 1860, *V. arancosa* Dalz. & Gibs. of India from 1861.

SPHAERALCEA **angusta** (Gray), comb. nov. *Malvastrum angustum* Gray in Mem. Am. Acad. n. s. iv[1]. (Pl. Fendl.), 22 (1849).

It is with great hesitation that I make a transfer in the complex and

quite unsettled group of *Sphaeralcea*, including *Malvastrum*. I follow Kearney in his *North American Species of Sphaeralcea Subgenus Eusphaeralcea* (Univ. Calif. Pub. Bot. xix[1]. (1935)) in uniting *Malvastrum*, typified by *M. coccineum* (Pursh) Gray, with *Sphaeralcea*. Rydberg has proposed *Sphaeralcea angusta* (*Malvastrum angustum* Gray) as a monotypic genus, *Sidopsis* Rydb. Fl. Pr. Pl. Centr. N. Am. 541 (1932). Unfortunately, however, the only species, with the stated range "Tenn.—Iowa—Kans.," was given the specific name "*S. hispida* (Ell.) Rydb.," based upon *Sida hispida* Ell. If Elliott be looked up it will be found that in his Sketch of the Botany of South-Carolina and Georgia, i. 159 (1821) he correctly assigned the name *Sida hispida* to Pursh, Fl. Am. Sept. ii. 452 (1814), where it was originally published for a plant of "sandy plains in Georgia" seen by him in Herb. Lyon. Whether or not Elliott's plant from South Carolina or Georgia was the same as the plant Pursh saw in Lyon's herbarium is not known. The range of his *Sidopsis hispida*, given by Rydberg, explicitly excludes the regions of both Pursh's and Elliott's plants. The plant occurring from western "Tenn.—Iowa—Kans." was listed from St. Louis (*Drummond*) by Hooker, Journ. Bot. i. 198 (1834), but whether it is what Pursh and Elliott had is open to serious question. In publishing his *Malvastrum angustum* Gray cited "Sida hispida, *Pursh; Fl.* 2. *p.* 452? *Hook.! Jour. Bot.* 1. *p.* 198" and continued: "This is probably Pursh's plant; but I have not seen it from Georgia. Drummond gathered it at St. Louis." In his latest statement, under *Malvastrum angustum*, Gray gave the synonymy: "*Sida hispida* Hook. Journ. Bot. i. 198, perhaps Ell. Sk. ii. 159, hardly Pursh, Fl. ii. 452."[1]

In view of the complete doubt about the identity of *Sida hispida* Pursh, which antedated Elliott by seven years and which was presumed by the latter author to be his plant, it is quite unwise to force upon the plant of dry barrens and hills of the Mississippi basin the name of an unidentified plant of Georgia and possibly South Carolina. I am, therefore, retaining for the plant of the Mississippi basin the first name which unquestionably belongs to it. If and when Pursh's type is found and positively identified with *Sphaeralcea angusta* Pursh's name will be justified; at present its use would be to questionable.

PASSIFLORA LUTEA L., var. **glabriflora**, var. nov., calicis tubo glaberrimo: caulibus glabris vel rarissime pilosis; foliis glabris.—

[1] Gray, Syn. Fl. N. Am. i[1]. 308 (1897).

Southern Ohio to Missouri, south to Tennessee, Arkansas and Texas. TYPE: base of cliff between Sugar Loaf and Falling Spring, St. Clair County, Illinois, October 5, 1918, *J. M. Greenman*, no. 3926.

All material in the Gray Herbarium from Ohio, Indiana, Kentucky, Tennessee, Illinois, Missouri, Arkansas, Oklahoma and Texas has the calyx and leaves quite glabrous and all but two sheets (from Texas) have the stems glabrous. Contrasted with this glabrous extreme in the interior of the country is the series from the Atlantic Slope. All specimens from eastern Pennsylvania, Delaware, Virginia, North Carolina, South Carolina, Georgia and Florida, which are in condition to show them, have the calyx-tubes pilose or hirsute. The stems, especially when young, are more or less pilose-hispid, in many plants abundantly and permanently so, in others with the pilosity disappearing in age. Since the type came from Virginia the plant with pilose calyx-tube must be treated as typical.

HYDROCOTYLE VERTICILLATA Thunb., var. **triradiata** (A. Richard), comb. nov. *H. tribotrys* Ruiz & Pavon, Fl. Peruv. iii. 24, t. 246, fig. *b* (1802). *H. polystachya* A. Richard, var. α *Triradiata* A. Richard in Ann. Gen. Sci. Phys. iv. 171 (repr. as Monogr. Gen. Hydrocotyle, 51) (1820). *H. racemosa* Moc. & Sessé ex DC. Prodr. iv. 70 (1830). *H. bonariensis* Lam., var. *tribotrys* (Ruiz & Pavon) G. Don, Gen. Hist. Dich. Pl. iii. 249 (1834). *H. prolifera* Kellogg, Proc. Calif. Acad. Sci. i. 15 (1854) and ed. 2, i. 14 (1873), not Otto (1839). *H. natans* Torr. Bot. Mex. Bound. 69 (1859). *H. umbellata* L., var. (?) *ambigua* Gray, Man. ed. 5: 190 (1867). *H. verticillata*, vars. *tenella*, *13-nervis*, *longipedunculata* and *pluriradiata* Urban in Mart. Fl. Bras. xi[1]. 268 (1879). *H. Canbyi* Coult. & Rose in Bot. Gaz. xii. 103, t. 4 (1887). *H. ambigua* (Gray) BSP. Prelim. Cat. N. Y. 21 (1888), not Pursh (1814). *H. australis* Coult. & Rose in Contrib. U. S. Nat. Herb. vii. 28 (1900).

I fully concur with Dr. Mathias in Brittonia, ii. 204 and 240 (1936) in feeling that the plant known in current manuals as *Hydrocotyle Canbyi* is separable from *H. verticillata* only through its pedicelled flowers and fruits. The synonymy given above is drawn from her papers. But, following the International Rules of Botanical Nomenclature, it becomes unfortunately necessary to add another to the many names under which the plant has been somewhat misinterpreted. Art. 55 reads, in part:

> When a variety or other subdivision of a species is transferred, without change of rank, to another genus or species (or placed under another generic or specific name for the same genus or species), the original subdivisional epithet must be retained or (if it has not been retained) must be re-established.

Treated as a variety, the plant under discussion should take the varietal name *triradiata*, the first trivial name given to it (by Achille Richard in 1820) as a variety. Instead, Dr. Mathias uses for it, as a variety, the first trivial name given to it as a species. In her treatment she indicates doubt as to the identity of *H. tribotrys* and of *H. polystachya* var. *triradiata* which was based upon it; but she expresses no doubt about the identity of *H. bonariensis* var. *tribotrys*, which was a mere nomenclatural transfer by George Don of *H. tribotrys* to varietal rank. Dr. Mathias explains her doubt as to the first two names, based on the same type, as follows:

> The type specimen of *H. tribotrys* R. & P. has not been seen and the plant in the Madrid Herbarium so named is obviously mislabeled since the leaves are non-peltate. This specimen has been referred to *H. alchemilloides*. The plant illustrated and described as *H. tribotrys* by Ruiz & Pavon apparently belongs to this variety.

The fact that someone, during more than a century, mislabeled as *H. tribotrys* a plant which is quite unlike that described and illustrated by Ruiz & Pavon does not alter the identity of the plant they so clearly described "foliis peltatis subrotundo-reniformibus . . . Flosculi in verticillos remotos, quinquefloros, . . . breviter pedunculati," and so beautifully illustrated. Dr. Mathias has no doubt that the plant illustrated and described was the ramose extreme of our *H. Canbyi;* neither have I. The Ruiz & Pavon description and plate were of the large extreme with trifurcate inflorescences; and they are readily matched by various specimens from as far north as Cape Charles ("Cape Charles, Maryland" [Virginia], *Tidestrom*, no. 11,615; Lake Worth, Florida, *A. H. Curtiss*, no. 5676; Georgetown, Texas, *Edw. Palmer*, no. 383 [or ?353]; Devil's River, Texas, *Havard*, no. 139; etc.). Since *H. polystachya* var. *triradiata* (1820) and *H. bonariensis* var. *tribotrys* (1834) were both based exclusively on the Ruiz & Pavon description and plate, Richard preferring to give a slightly better name, the doubt indicated regarding the former would apply equally to the latter. I do not feel that there is appreciable doubt.

In the Gray Herbarium Dr. Mathias, in 1935, placed revision-labels indicating for *H. verticillata* var. *triradiata* a varietal combination different from the one she later published. The unpublished combination, based upon *H. prolifera* Kellogg (1854), doubtless occurs in other herbaria. Care should be taken to guard against its inadvertent publication.

CICUTA MACULATA L., var. **Curtissii** (Coult. & Rose), comb. nov. *C. curtissii* Coult. & Rose, Contrib. U. S. Nat. Herb. vii. no. 1—Mon. N. Am. Umbelliferae, 97 (1900).

Coulter & Rose separated the southern Coastal Plain *Cicuta Curtissii* from the northern and wide-ranging inland *C. maculata* by "rootstock much thicker; leaflets thickish, conspicuously reticulate beneath; fruit orbicular, 2 mm. long, constricted at the commisure; ribs approximately equal in surface display; the laterals largest in section, but not wedge-shaped or closely contiguous; dorsal and intermediate ribs about as broad as the intervals; oil tubes large." The type cited was *Curtiss* no. 1030 from Duval County, Florida; and the range was given as "From southern Virginia and southeastern Kentucky to Florida and Louisiana." Since their *C. Curtissii* had previously been confused with *C. maculata*, their definition of the latter becomes important; "leaflets rather thin, from narrowly lanceolate to oblong-lanceolate, . . . coarsely and sharply serrate, . . . reticulation indistinct; fruit oblong, 4 mm. long, not constricted at the commissure," etc. In brief, as shown by the type number and by much other material from stations north to Virginia, the leaflets of *C. Curtissii* are oblong-lanceolate to lance-ovate, with the secondary veins prominent beneath, the margins coarsely crenate to serrate-dentate with broad-based semi-ovate teeth, the larger leaflets of the lower (ternately decompound) leaves 2.5–5.5 cm. broad; fruits nearly round, 2–3 mm. long, the marginal ribs separated by a clearly defined dark furrow.

Cicuta maculata, as left by Coulter & Rose, when they separated off their *C. Curtissi*, is of wide range from the Gaspé Peninsula, Quebec to eastern Manitoba, south across the northern states to the uplands of North Carolina, and Tennessee, Missouri and Oklahoma. Its thin leaflets are narrowly to broadly lanceolate or lance-oblong, with the secondary veins less prominent beneath as compared with *C. Curtissii*, the margins sharply serrate with prolonged lanceolate teeth, the larger leaflets 0.5–3 cm. broad; fruits ellipsoid or ovoid, 2.5–4 mm. long, the marginal ribs confluent until maturity, without a dark intermediate furrow.

If the two series would stay within these bounds there would be no question of their specific distinctness; but, unfortunately, it is not difficult to find quite reniform-globose fruits with the marginal ribs wholly confluent but with the thin and slender-toothed leaflets in the

North, while many otherwise typical specimens of *C. Curtissii* from the South have a few fruits with confluent marginal ribs mixed with the more typical fruits in the same umbel. In fact, Coulter & Rose themselves threw a doubt on the specific distinctness of *C. Curtissii*. They cited the 11 sheets of typical *C. Curtissii* which they had seen; but under *C. maculata* cited 9 others which were atypical of the latter species, "the leaves . . . thicker and strongly reticulated, as in *C. curtissii*, the two types of fruit are represented—one with very broad corky ribs and narrow intervals, the other with ribs and intervals as in *C. maculata* but with fruit almost orbicular." Small, likewise, maintaining the two as species, *C. maculata* with "typically" oval or ovoid fruits, *C. Curtissii* with them "typically" subglobose or reniform-globose, referred to globose-fruited northern specimens with the foliage and confluent marginal ribs of *C. maculata* as "sporadic" *C. Curtissii* "as far North as Nova Scotia" (Man. 975). In short, Coulter & Rose found the characters used to separate the two extremes not constant; neither did Small; neither do I.

Cicuta maculata, until Coulter & Rose's separation from it of *C. Curtissii*, was treated as an unvarying species, except for var. *angustifolia* Hook. Fl. Bor.-Am. i. 259 (1834) from the Saskatchewan, a plant very inadequately described but probably belonging to the western *C. occidentalis* Greene. In originally publishing *Cicuta maculata* L. Sp. Pl. i. 256 (1753) Linnaeus had in mind both the thin-leaved plant with slender teeth and *C. Curtissii*. He gave an original diagnosis based on the plant in his own herbarium, with "serraturis mucronatis." This was a specimen from Kalm and the photograph of it, kindly supplied by Mr. Savage, well shows the common northern thin-leaved extreme with lance-attenuate slender-toothed leaflets. After his own diagnosis Linnaeus cited *Aegopodium foliolis lanceolatis* of Gronovius; then he gave a reference to a Plukenet figure, and last (also least, in importance) a reference to Morison. Plukenet's figure is of *C. maculata*, as left by Coulter & Rose, after they removed *C. Curtissii;* but, to give an element of confusion to the matter, the Clayton plant on which Gronovius based his *Aegopodium foliolis lanceolatis* was, as shown by the beautiful photograph supplied by Mr. Ramsbottom, very characteristic *C. Curtissii*. This, in view of the fact that Linnaeus included both extremes, would be of only secondary interest had not Coulter & Rose specially designated the Clayton specimen as typical of *C. maculata:* "Type locality. 'in Virginiae aquosis'; collected by Clayton."

Photo. W. H. Hodge

CICUTA VICTORINII: FIG. 1, TYPE, × ½; FIG. 2, fruits, × 10.
C. MACULATA: FIG. 3, fruits, × 10.

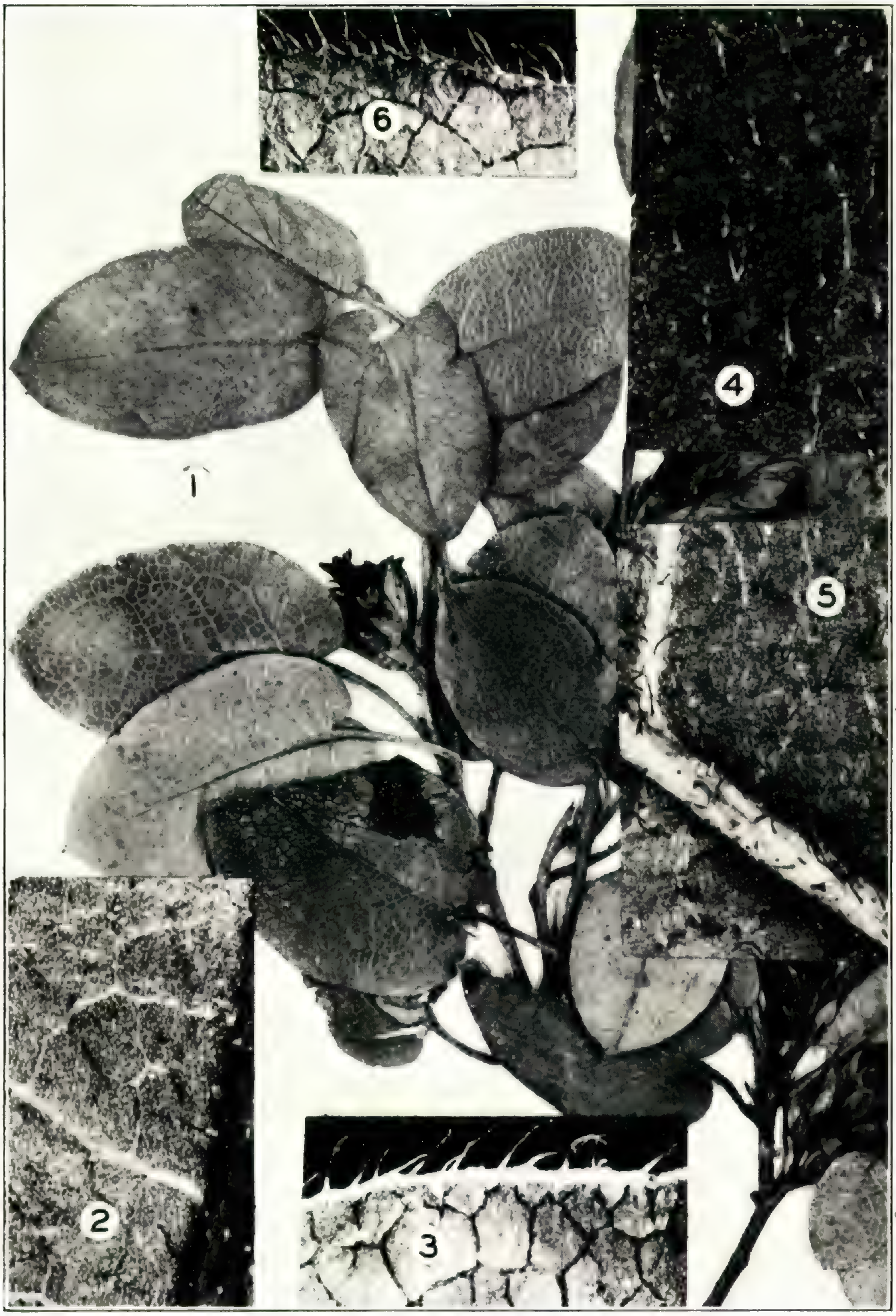

Photo. W. H. Hodge

EPIGAEA REPENS: FIG. 4, upper surface of mature leaf, × 10; FIG. 5, lower surface, × 10; FIG. 6, ciliation, × 10.

Var. GLABRIFOLIA: FIG. 1, portion of TYPE, × 1; FIG. 2, lower surface of leaf, × 10; FIG. 3, ciliation, × 10.

In view, however, of the facts that neither Coulter nor Rose had seen the specimens studied by Linnaeus and that their definition of *C. maculata* accords with the specimen in the Linnean Herbarium, not with that of Clayton, I am taking as the type of *C. maculata* the former specimen. Surely Coulter & Rose did not understand the specimens, for they certainly would not have set up *C. Curtissii* as a new species (which abounds in eastern Virginia) and immediately have intentionally designated as type of the Linnean species a characteristic specimen of their proposed new species. By holding to the specimen which Linnaeus himself had prior to 1753 confusion is avoided.

CICUTA **Victorinii**, sp. nov. (TAB. 561), planta perennis radicis tuberoso-carnosis; caulibus 3–6 dm. altis; foliis biternatis, segmentis lineari-lanceolatis 1.5–4 cm. longis dentato-serratis; umbellis 3–8 cm. latis; fructibus reniformibus vel cordato-ovoideis, 3.5–4 mm. longis, costis lateralibus prominentibus aliis obscuris.—Tidal flats of the St. Lawrence River, QUEBEC: grèves intercotidales, Cap Rouge près du Pont de Québec, 9 août 1922, *Victorin*, no. 15,479 (TYPE in Herb. Gray, ISOTYPES in Herb. Univ. Montréal and in Herb. Victorin); grèves intercotidales, St. Laurent de l'Ile d'Orleans, 16 août 1922, *Victorin*, no. 15,480 (in same herbaria).

In its reniform or cordate-ovoid fruits with all the ribs obscure except for the 2 laterals *Cicuta Victorinii* is very distinct. Its very narrow and relatively few leaf-segments are also distinctive. In the wide-ranging and coarse *C. maculata* L., the common species of eastern North America, the ellipsoid or ovoid fruits (FIG. 3) have alternating rounded ribs and dark furrows, usually with the marginal ribs confluent until maturity. *C. Victorinii*, collected only by Brother Victorin, is another of the notable species restricted to the estuary of the St. Lawrence.

In PLATE 561, FIG. 1 shows a plant, × ½, of the TYPE-COLLECTION; FIG. 2, a group of fruits, × 10.[1] FIG. 3 is a group of mature fruits, × 10, of *C. maculata* from Bridgewater, Nova Scotia, *Fernald & Long*, no. 24,249.

ZIZIA **aptera** (Gray), comb. nov. *Thaspium trifoliatum* (L.) Gray, var. *apterum* Gray, Man. ed. 2: 156 (1856).

Zizia aptera is the transcontinental plant which regularly passes as *Z. cordata* (Walt.) Koch in DC. Prodr. iv. 100 (1830). The name *Z.*

[1] The umbellets all show the result of being twice-a-day submerged, their pedicels being enmeshed with extraneous matter.

cordata rests upon *Smyrnium cordatum* Walt. Fl. Carol. 114 (1788); but, unfortunately, it must be abandoned for the species of *Zizia* for two reasons. In the first place *Smyrnium cordatum* was an illegitimate name given by Walter as a substitute for *Thapsia trifoliata* L. Sp. Pl. i. 262 (1753). Nomenclaturally *Smyrnium cordatum* is the same as *Thapsia trifoliata;* it could not properly be the basis of a combination under *Zizia* because the type of *Thapsia trifoliata* is well known to be a member of *Thaspium.* Blake, examining the type of the latter, reported[1] that it is the eastern plant described as *Smyrnium atropurpureum* Desr.; Gray, many years earlier, in a detailed manuscript on the Linnean Herbarium, recorded "*Thapsia trifoliata* = *S. atropurp.*"; and the sheet in the Linnean Herbarium, bearing in the hand of Linnaeus "*trifoliatum,*" shows, through the photograph supplied by Mr. Savage, that the identifications of Gray and, later, of Blake are not to be questioned. Although Gray, in 1856, had not cleared the two generic elements, *Thaspium* and *Zizia,* he did understand the identities of the two plants in question. In edition 2 of the Manual, l. c., he took up as an aggregate species *Thaspium trifoliatum,* with two varieties: var. *atropurpureum* with the correct synonymy "Thápsia trifoliata, *L.* Smyrnium cordatum, *Walt.* Thaspium atropurpureum, *Nutt.*"; and the new "Var. **ápterum.** Petals yellow: fruit with sharp ribs in place of wings. (Zizia cordata, *Koch, Torr.*)" In other words, Gray correctly distinguished *Zizia cordata,* as understood by Koch and by Torrey (sensu Koch and Torrey), from *Smyrnium cordatum* Walt., which he knew to be based upon and identical with *Thapsia trifoliata* L.; but, as already indicated, since Walter had substituted for the Linnean *Thapsia trifoliata* his new name *Smyrnium cordatum,* his specific epithet cannot be made the basis of a combination in another genus.

Even if it be argued by those (if there are any) who think with Farwell[2] that the citation by an author, when he publishes a new name with a diagnosis, of a previously published name does not mean that he intended the two as synonymous, the fact remains that the only one of the two plants, *Thaspium trifoliatum* and *Zizia aptera,* known in Walter's territory is the former. This (typical *T. trifoliatum,* with umbels only 1.5–3(–4) cm. broad, the greenish to purple flowers all stalked and the rounded-ellipsoid fruits with broad dorsal wings) is

[1] See Blake, RHODORA, xx. 52 (1918).
[2] Farwell, Mich. Acad. Sci. Rep. xxi. 368 (1920) and RHODORA, xli. 80 (1939).

generally dispersed in the region known to Walter. *Zizia aptera*, a true *Zizia* with the central flower and fruit of the umbellet sessile, the fruits with filiform ribs, and in *Z. aptera* the flowers yellow, is not known in Walter's territory. The only specimens of it seen by Coulter & Rose from the Atlantic states south of the Potomac were from Asheville, North Carolina. Collections, mostly since the time of Coulter & Rose, show it to be in the upland and piedmont regions of Virginia and northern North Carolina, thence along the mountains to Georgia. I have seen no material of it from Walter's region of southeastern South Carolina.

In connection with the taking up for the transcontinental *Zizia* of the name *aptera*, based upon an old varietal name, it is necessary to note *Z. sylvatica* Benke in RHODORA, XXXV. 45 (1933). Its author distinguished *Z. sylvatica* from "*Z. cordata* (Walt.) DC." as follows:

> "*c.* Cauline leaves all divided; rays of umbel rather as in *Z. aurea;* plants mostly of open ground.....*Z. cordata* (Walt.) DC.
> *c.* One or more cauline leaves undivided; other leaves and umbel rather as in *Z. Bebbii;* plants of shaded woods .....*Z. sylvatica.*"

The type of *Zizia sylvatica* was from Tunnel Hill, Johnson County, Illinois, *Benke*, no. 5252. A beautiful sheet of the type collection, most kindly sent to the Gray Herbarium, shows the young fruits with the definite wings of *Thaspium*. In its upper trifoliolate leaves it is quite inseparable from characteristic material of *T. trifoliatum*, var. *flavum* Blake, the inequilaterally round-based and long-acuminate leaflets closely matched in the type of var. *flavum* and in many other specimens from woodlands and bottoms of West Virginia, Ohio, southern Michigan, Indiana, Kentucky, Tennessee, Illinois, Missouri and Arkansas. Although trifoliolate cauline leaves are more common in the typical *Thaspium trifoliatum* than in its generally more inland var. *flavum*,[1] simple ovate cauline leaves sometimes occur in each of them and occasionally nearly all (4 out of 5) of the cauline leaves of the former may be simple. I can find nothing to separate the isotype of *Zizia sylvatica* from *Thaspium trifoliatum*, var. *flavum*. Mr. Benke states that the cauline leaves of *Zizia aptera* (*Z. cordata* of authors) are "all divided."

[1] *Thaspium trifoliatum* is above defined. Var. *flavum* Blake in RHODORA, XX. 53 (1918), extending inland to Minnesota and south to Alabama and Arkansas, differs in its generally greater size, coarser and more knotty rhizome, simple basal leaves (when present) 3–10 cm. long (in typical *T. trifoliatum* 1.5–5 cm.); cauline leaves at 1st fork of stem with terminal leaflet 3–8 cm. long (as opposed to 2–4.5); umbel 3–9 cm. broad (as opposed to 1.5–4); petals yellow; and fruit 4–5 (instead of 3–4) mm. long.

In the rather small representation of it in the Gray Herbarium, however, 1 or more simple cauline leaves are shown in 26 specimens (Staten Island, New York, *N. L. Britton;* Allegany State Park, New York, *Alexander & House,* no. 13112; Normansville, New York, *Burnham;* Mt. Cuba, Delaware, *Baker, Market & Goodale,* no. 53893; Long Mt., Frederick County, Virginia, *Griscom & Hunnewell,* no. 18782; Weldon, North Carolina, *E. B. Bartram;* and 20 numbers westward to the Pacific slope.

The type of *Thaspium trifoliatum*, var. *apterum* Gray, therefore of *Zizia aptera,* is the only sheet so marked by Asa Gray in the Gray Herbarium at the time of publishing the variety: a sheet in good fruit from "New York & New Jersey." Throughout most of its range *Z. aptera* has the subcoriaceous leaflets of the upper leaves closely and finely toothed. In the northwestern area of its occurrence, however, the leaves become membranaceous and the leaflets of the upper cauline ones are lacerate or coarsely jagged-toothed. This extreme I am calling

Z. APTERA, var. **occidentalis**, var. nov., foliis membranaceis; foliorum superiorum foliolis laceratis.—IDAHO: Soda Springs, June 21, 1892, *Mulford;* west side Sautianne Divide, Coeur d'Alene Mts., June 23, 1895, *Leiberg,* no. 1018. UTAH: swampy ground, Goodman's Ranch, near Bear River, Summit County, July 12, 1926, *E. B. & L. B. Payson,* no. 4957. OREGON: Sauvies Island, June, 1877, *Howell;* wet soil of Wallowa River, 3800 feet alt., June 11 and July 20, 1900, *Cusick,* no. 2401 (TYPE in Gray Herb.). WASHINGTON: meadows, Crab Creek country, June 13, 1884 and Spokane County, June 27, 1884, *Suksdorf,* no. 316; Pullman, July 24, 1893, *Piper,* nos. 1557, 1559; low meadows between Tonasket and Republic, Okanogan County, June 29, 1931, *J. W. Thompson,* no. 7120.

ZIZIA AUREA (L.) Koch, forma **obtusifolia** (Bissell), comb. nov. *Z. aurea,* var. *obtusifolia* Bissell in RHODORA, ii. 225 (1900).

EPIGAEA REPENS L.—To one familiar with *Epigaea repens* in Newfoundland, Canada and the northern states the plant of eastern Virginia seems surprisingly scabrous to touch; and study of the more than 300 collections in the Gray Herbarium and the herbarium of the New England Botanical Club shows that there are two well defined geographic varieties: (1) the southern extreme (FIGS. 4–6), with the over-wintered leaves scabrous on both surfaces with persistent, dark (becoming blackish) stiff hairs; (2) the northern extreme (FIGS. 1–3), with the lower old leaf-surface glabrous and nearly or quite smooth to touch (except sometimes for the hairy midrib), the upper surface

glabrous or promptly glabrate. The occurrence (number of specimens studied) of these two varieties by states and provinces is indicated in the accompanying table, the numbers (1 and 2) indicating the varieties as above defined.

	Var. 1	Var. 2		Var. 1	Var. 2
Newfoundland	0	11	Long Island	2	0
Quebec	0	19	New Jersey	5	0
Prince Edward Island	0	3	Pennsylvania	4	3
New Brunswick	0	2	West Virginia	1	2
Nova Scotia	0	7	Virginia	10	2
Ontario	0	5	North Carolina	3	2
Maine	0	56	Georgia	2	0
New Hampshire	0	54	Ohio	2	1
Vermont	0	18	Kentucky	3	0
Massachusetts	38	63	Tennessee	3	1
Rhode Island	5	0	Alabama	1	0
Connecticut	2	9	Michigan	0	2
New York (excluding Long Island)	1	11	Wisconsin	0	1
			Iowa	0	2

It will be at once evident that the southern extreme is not found in Newfoundland, Canada and northern New England and has not been seen from Michigan, Wisconsin and Iowa; conversely the northern variety, the only one known from these areas, becomes rare southward. In Massachusetts the northern plant with glabrous lower leaf-surfaces is generally dispersed, but all the material from the outer islands (Nantucket and Martha's Vineyard) and most from the southeastern mainland northward into Norfolk and southern Worcester Counties and up the sand plains of the Connecticut Valley is the southern extreme. From New York the only material of the southern extreme in the small representation studied is from Long Island and from the sand plains of the Hudson. The only Virginian material seen of the northern variety is from Bath and Giles Counties and the glabrous-leaved material from North Carolina (Lynn, Polk Co., and Blowing Rock) and Tennessee (Cade's Cove at 2300 feet) is from the mountains.

It is very clear then, that *Epigaea repens* occurs as two well defined geographic varieties ("subspecies," "apomicts," "races"): a prevailingly southern plant with mature leaves scabrous and persistently setose or pilose on both surfaces; and a prevailingly northern plant with the mature leaves glabrous (except for the sometimes pilose midrib) beneath (or promptly glabrate), the upper surface usually glabrous or glabrate. In the ciliation of leaves (before too much weathering) there is a strong tendency for the marginal hairs of the southern plant to be more crowded (FIG. 6) than in the northern (FIG. 5). This, how-

ever, is a secondary character. The half-expanded new foliage of the southern variety and of the northern variety well display the chief difference, the expanding leaf of the former pilose over the whole surface, that of the latter completely glabrous or glabrous between the more or less pubescent nerves.

In establishing the binomial, *Epigaea repens* L. Sp. Pl. 395 (1753) Linnaeus gave the "*Habitat in* Virginiae, Canadae *pinetis*"; but he cited only references to the plant of eastern Virginia:

> 1. EPIGAEA. *Gen. nov.* 1087. *repens.*
> Memecylum. *Mich. gen.* 13.
> Arbutus foliis ovatis integris, petiolis laxis longitudine foliorum. *Gron. virg.* 49.
> Pyrolae affinis repens fruticosa, foliis rigidis scabritie exasperatis, flore pentapetaloide fistuloso. *Pluk. alm.* 309. *t.* 107. *f.* I.
> *Habitat in* Virginiae, Canadae *pinetis*. ♄.

Mitchell's *Memaecylum* [original spelling], one of his "Nova genera plantarum Virginiensium" was, obviously, the southern extreme. Gronovius, quoting Clayton, said "foliis . . . scabris rigidis"; and Plukenet, with Virginia specimens from Banister, specially emphasized the harsh leaves, "Foliis rigidis, scabritie asperatis." There can be no question that the scabrous-leaved southern variety is typical *Epigaea repens*. The northern extreme may be called

EPIGAEA REPENS L., var. **glabrifolia**, var. nov. (TAB. 562, FIG. 1–3), foliis subtus glabris vel glabratis (venis interdum exceptis), paginis superioribus glabris vel glabratis.—Labrador to Saskatchewan, south to Newfoundland, Nova Scotia, New England, Pennsylvania, West Virginia, Ohio, Michigan, Wisconsin and Iowa, and along the mountains to North Carolina and Tennessee. TYPE: dryish open sandy plains, Middleton, Nova Scotia, July 20, 1920, *Fernald, Pease & Long*, no. 22,167 (in Gray Herb.).

In PLATE 562, FIG. 1 is a portion of the TYPE of var. *glabrifolia*, × 1; FIG. 2, the lower surface of a leaf, × 10; FIG. 3, lower surface and ciliation, × 10; FIGS. 4–6, details of typical *Epigaea repens:* FIGS. 4 and 5, upper and lower surfaces of leaf, × 10, from near Surry, Virginia, *Fernald & Long*, no. 9763; FIG. 6, ciliation of leaf, × 10, from Eastham, Massachusetts, *F. S. Collins*.

ASCLEPIAS INCARNATA L., var. PULCHRA (Ehrh.) Pers., forma **candida**, nom. nov. *A. pulchra* Ehrh., forma *albiflora* House, N. Y. State Mus. Bull. ccxliii.–ccxliv. 61 (1923), not *A. incarnata*, forma *albiflora* Heller in Bull. Torr. Bot. Cl. xxi. 24 (1894).

BACOPA **cyclophylla**, nom. nov. *Herpestis rotundifolia* Gaertn. f.,

Fruct. iii. 186 (1807), not *B. rotundifolia* (Michx.) Wettst. in Engl. & Prantl. Nat. Pflanzenf. iv^{3b}. 76 (1891).

As shown by Pennell in Proc. Acad. Nat. Sci. Phila. lxxi. 244, for Dec., 1919 (March, 1920) and in Acad. Nat. Sci. Phil. Mon. i. 62, 63 (1935), *Herpestis rotundifolia* Gaertn. f., based primarily on a Bosc specimen, is not identical with *Monniera rotundifolia* Michx. (1803), which was the basis of *Bacopa rotundifolia* (Michx.) Wettst. Although *B. cyclophylla* is clearly distinct from *B. rotundifolia*, Pennell's definition of the latter (as *Macuillamia rotundifolia* (Michx.) Raf.) leaves the student in doubt. In defining *Macuillamia* on p. 49 (Mon. i. or Scroph. E. Temp. N. Am.) it is distinguished by "Corolla 7–8 mm. long"; but in the key to species on p. 57, *M. rotundifolia* and *M. obovata* are placed in a section with "corolla 5–7 mm. long" as contrasted with a third species with "corolla 3–4 mm. long." The helpless user of the key is "left high and dry." So he is when he trys the length of pedicels in the same key to species (p. 57). The first two species come under "pedicels 10–15 mm. long"; but the first of them there included is described with "pedicel 8–18 mm. long," the second with "pedicel 4–6 mm. long."

The North American Varieties of Veronica alpina (Plates 563–568).—The circumpolar *Veronica alpina* L. has at least seven strongly marked geographic varieties, six of them occurring in North America. In his "'Veronica' in North and South America"[1] Pennell (p. 14) defined true *V. alpina* (our pl. 563, figs. 1 and 2) of "Open slopes, East Greenland. Also in Scandinavia and the Highlands of Scotland," with "Capsule glabrous. Sepals glabrous on back, ciliate on margins, apparently but little shorter than the corolla. Plant usually 1–2 dm. tall, usually little branched at base," while he separated the European variety (our pl. 563, figs. 3 and 4) with "Capsule pubescent with glandless hairs. Sepals pilose on back as well as margins, much shorter than the corolla" as *V. pumila* Allioni; the latter extending south to the Pyrenees, Maritime Alps, Cevennes, etc. In all North America proper (west of Greenland) only the single *V. Wormskjoldi* was recognized, the variety of *V. alpina* with "Capsule and sepals with hairs which have rounded glandular tips, the sepals densely pilose on back. Plant usually 1.5–3 dm. tall, with pedicels 2–5 (–10) mm. long." *V. Wormskjoldi* (pl. 564) is the boreal American

[1] Pennell in Rhodora, xxiii. 1–22 and 29–41 (1921).

plant which, more conservatively, is known as *V. alpina*, var. *unalaschcensis* Cham. & Schlecht. (1827) or in Greenland as var. *villosa* (Wormskj.) Lange (1887). Pennell admitted the doubtfully worth while *V. Wormskjoldi nutans* (Bong.) Pennell, from the coast of Alaska; but in the three different plants of the cordilleran series (PL. 566–568) he saw only "a tendency . . . to have styles slightly longer, usually 1/4 to 1/3 the length of the capsule, rather than 1/6 to 1/4." Pennell's study is, so far as I am aware, the latest revision of all American members of the genus as such, although in 1932 he noted[1] the occurrence of *V. alpina* in both West and East Greenland and in Baffin Land. His "Scrophulariaceae of Eastern Temperate North America"[2] does not discuss the series, through the somewhat unique definition of Eastern Temperate North America as stopping at "the eastern border of New York on the east" (p. 1). Thus Pennell excluded from his consideration of the *Scrophulariaceae* of eastern temperate North America the *Veronica alpina* series of New Hampshire, Maine, Quebec and Newfoundland. Had his critical eye noted the alpine plant of northern Newfoundland (PL. 565), which I had misidentified as *V. alpina*, var. *unalaschcensis*, he would have found it as different from that too inclusive entity (*V. Wormskjoldi*) as the latter is from the southern European *V. pumila* of Allioni (PL. 563, FIGS. 3 and 4). Not only is the Newfoundland plant unique and really as near to *V. pumila* as to *V. Wormskjoldi;* the great mass of material from the Rocky Mountains to the Pacific seems to me strikingly unlike *V. Wormskjoldi*, to which Pennell and also Rydberg refer all cordilleran material. *V. Wormskjoldi* (*V. alpina*, var. *unalaschcensis*) occurs locally on alpine summits (at 3050–3500 m. alt.) south to Colorado, but most of the cordilleran material, from subalpine to Canadian areas, falls into three strikingly different endemic varieties (PLATES 566–568), one of wide range, another more restricted and in some characters more pronounced, another chiefly of the Cascade Mts. My interpretation of *Veronica alpina* in North America is condensed into the following synopsis.

a. Backs of sepals quite glabrous, the margins ciliate; capsule glabrous; flowering stems 0.5–2 dm. high; fruiting raceme dense, thick-cylindric, ellipsoid or obovoid, with most of the fruits imbricated . . . . . *V. alpina*, var. *typica.*

a. Backs of sepals and the capsules more or less pubescent . . . . *b.*

[1] RHODORA, XXXIV. 150 (1932).

[2] Acad. Nat. Sci. Phila. Mon. I. (1935).

Photo. W. H. Hodge

VERONICA ALPINA, var. TYPICA: FIG. 1, flowering plant, × 1, from Greenland; FIG. 2, mature calyx and capsule, × 10, from Greenland.

Var. AUSTRALIS (Var. *lasiocarpa; Veronica pumila*): FIG. 3, fruiting plant, × 1, from Hautes-Pyrénées; FIG. 4, calyx and capsule, × 10, from the Alpes Maritimes.

Photo. W. H. Hodge

VERONICA ALPINA, var. UNALASCHCENSIS (*V. Wormskjoldi*): FIG. 1, fruiting plants, × 1, from Labrador; FIG. 2, calyx and capsule, × 10, from plant in fig. 1; FIG. 3, less pubescent calyx and capsule, × 10, from Labrador; FIG. 4, less pubescent calyx and dehisced capsule, × 10, from New Hampshire.

b. Fruiting raceme dense, thick-cylindric, ellipsoid or obovoid, 1–6.5 cm. long, 1–1.6 cm. thick, the fruits closely approximate to strongly imbricated, except for the 1–3 lowest sometimes subremote ones, villous with multicellular hairs; mature style (capping fruit) 0.8–1.8 mm. long.

Leaves blackened in drying, those midway on the stem 4–20 mm. broad; upper internodes of stem spreading-long-villous; ciliation of sepals long-villous, partly of round-tipped ("glandular") septate trichomes; capsules fuscous or greenish- or bluish-black, copiously villous with chiefly round-tipped trichomes. . . . . Var. *unalaschcensis.*

Leaves only slightly or barely blackening, those midway on stem 3–7 mm. broad; upper internodes of stem short-pilose or incurved-villous with mostly slender-tipped hairs; ciliation of sepals short-pilose; capsules pale-brown, sparsely villous. . . . . Var. *terrae-novae.*

b. Fruiting raceme lax, the distinctly pedicelled fruits or pairs of fruits mostly becoming distant, the mature racemes (1–) 3–15 cm. long. . . . *c.*

c. Foliage-leaves 4–8 pairs, mostly opposite, blackening in drying, the upper ovate and acutish, the larger 1–2.2 cm. broad; lower bracts of raceme mostly lanceolate to ovate and equaling to exceeding their subtended flowers and fruits, upper bracts similar but narrower and shorter; lower 2–8 pairs of flowers and fruits opposite or subopposite; calyx 4–7 mm. long; style 0.75–1.5 mm. long; stems 1–4 dm. high. . . . . Var. *geminiflora.*

c. Foliage-leaves mostly oblong-lanceolate, elliptic or elliptic-ovate, with blunt or rounded tips, the larger 5–17 mm. broad; lower bracts of raceme mostly linear to lanceolate, the upper inconspicuous; calyx 2.5–4 mm. long; style 1.5–3 mm. long.

Leaves 4–7 pairs, often also 1–6 scattered alternate narrow upper ones, commonly drying green, the larger 5–12 (–17) mm. broad; flowers and fruits 9–25, mostly alternate; fruiting raceme slenderly cylindric, much interrupted, up to 1.2 dm. long, 0.5–1.2 cm. thick; sepals acute or acutish; capsule elliptic or narrowly obovate, 2.5–4 mm. broad; stems 1–3.3 dm. high. . . . . Var. *alterniflora.*

Leaves 3–5 (–6) pairs, all usually opposite, drying black, the larger 7–17 mm. broad; flowers and fruits 3–18, frequently opposite, the lower 1–3 pairs distant, the others subapproximate; fruiting raceme 1–7 (–9) cm. long, 1–1.4 cm. thick; sepals obtuse; capsule elliptic-suborbicular or broadly obovate, 4.5–5 mm. broad; stems 0.5–2 (–3) dm. high . . Var. *cascadensis.*

V. ALPINA L., var. **typica.** *V. alpina* L. Sp. Pl. 11 (1753); Pennell in RHODORA, xxiii. 14 (1921), ibid. xxxiv. 150 (1932); Devold & Scholander in Skrifter om Svalbard og Ishavet, no. 56 (Fl. Pl. and Ferns Se. Greenland): 82, figs. 16 (center) and 17 (1933). *V. alpina, α lapponica* Wahlenb. Fl. Carpat. Princip. 5 (1814).—Northern and alpine Europe and western Siberia; Greenland; eastern Arctic America, south to Port Burwell, Hudson Straits, northern tip of Labrador Peninsula (*Malte,*

nos. 120,142 and 120,177, both, as represented in the Gray Herbarium, a mixture of *V. alpina* vars. *typica* and *unalaschcensis*).

Var. *typica* (pl. 563, figs. 1 and 2), is ordinarily quite distinct in its glabrous capsule and the glabrous backs of the sepals; also in the usually non-ciliate upper leaves. The last character breaks and it is not difficult to find plants of Labrador and New England, otherwise good var. *unalaschcensis*, with essentially glabrous backs to the sepals (pl. 564, figs. 3 and 4). Although Pennell restricts typical *V. alpina* in Europe to "Scandinavia and the Highlands of Scotland," Devold & Scholander (l. c. 83) state that it is found south to the Swiss Alps. Pennell assigns typical *V. alpina* "Sepals . . . apparently little shorter than the corolla." This is, of course, a relative character; but several modern specimens before me show. the corolla fully twice as long as the calyx (pl. 563, fig. 1) and it is so shown in many illustrations. It cannot, therefore, be maintained as a constant character, that the sepals are only a little shorter than the corolla. Although var. *typica* is ordinarily characterized by its strictly glabrous capsule, there are in the Gray Herbarium several collections from Labrador and New Hampshire (pl. 564, figs. 3 and 4) with the nearly glabrous sepals almost of var. *typica* but with the capsules bearing some of the septate trichomes which, theoretically, should never be found on plants with glabrous-backed sepals; consequently, when it is maintained that the polymorphic North American series which Pennell and, following him, Devold & Scholander, call a species, *V. Wormskjoldi*, is specifically separated from *V. alpina*, var. *typica* because it has pubescent capsules and pubescent backs of the sepals, it must be admitted that the pubescence varies from dense and abundant to very sparse or almost negligible (pl. 564, figs. 2–4).

Var. unalaschcensis Cham. & Schlecht. in Linnaea, ii. 556 (1827); Robinson & Fernald in Gray, Man, ed. 7: 728 (1908). *V. Wormskjoldi* Roemer & Schultes, Syst. i. 101 (1817); Pennell in Rhodora, xxiii. 15 (1921), as *Wormskjoldii;* Devold & Scholander, l. c. 84, figs. 16 (right) and 18 (1933); Hultén, Fl. Aleut. Isl. 291 (1937). *V. villosa* Wormskj. ex Roemer & Schultes, l. c. as syn. (1817). *V. alpina*, var. *Wormskioldii* (Roem. & Sch.) Hook. Bot. Mag. lvii. t. 2975, as to source of name (1830). *V. nutans* Bong. in Mém. Acad. Petersb. ii. 157 (1833). *V. alpina*, var. *villosa* (Wormskj.) Lange, Consp. Fl. Groenl. 261 (1887), name taken from "v. v i l l o s a Wormskj. mscr." *V. Wormskjoldi nutans* (Bong.) Pennell in Rhodora, xxiii. 15 (1921).—Greenland and Arctic America, south to subalpine meadows, wet rocks and moss and brook-sides of Shickshock Mts., Gaspé Co., Quebec, Mt.

Katahdin, Maine and White Mts., New Hampshire; along the higher Rocky Mts. to Colorado (3050–3500 m.); Pyrenees.

Var. *unalaschcensis* (PL. 564), apparently not differing from var. *villosa* (*V. Wormskjoldi*), has, as already noted, been stretched to cover nearly all North American plants of the *V. alpina* affinity. In its restricted sense it is the most northern of the series with regularly pubescent capsules, although in subalpine to alpine situations it extends southward to Gaspé, northern New England and Colorado. Much emphasis has been placed by recent authors (Pennell, Devold & Scholander, Hultén) upon the gland-tipped trichomes of its capsule and calyx, as opposed to the nonglandular trichomes of *V. alpina*, var. *australis* Wahlenb. (1814) or var. *lasiocarpa* Hartm. (1832) (*V. pumila* Allioni) of Europe (PL. 563, FIGS. 3 and 4). There is a not always perfectly clear difference in the hairs; whether they are actually gland-tipped in var. *unalaschcensis* I have not fully convinced myself. Like the trichomes of var. *australis* they are septate and moniliform. In var. *australis* (or var. *lasiocarpa*) (PL. 563, FIG. 4) the cells are elongate and the terminal one prolonged and without conspicuous dark content. In var. *unalaschcensis* the cells are shorter and the terminal cell, after the shrinking of the trichome in drying, shows as an ovoid to subglobose short tip, sometimes with dark content. Since they have very regularly been called gland-tipped hairs we will so call them.

Pennell (RHODORA, xxiii. 14, 15) allows the European plant capsules and sepals only with "pubescence with glandless hairs" and a height of "usually .5–1 dm.," while his *V. Wormskjoldi* has the "hairs with rounded glandular tips" and a height of "usually 1.5–3 dm." In view of Pennell's inclusion under his "*V. Wormksjoldii*" of five quite different and mostly isolated North American plants (one with stems up to 4 dm. high, two with them down to 0.5 dm., one with dense subcapitate fruiting racemes sometimes only 1 cm. in length, another with the loose and remotely fruited racemes up to 1.5 dm. long) which differ from one another as much as do *V. Wormskjoldi* and *V. pumila*, it is worth noting that the gladular hairs usually ascribed only to var. *unalaschcensis* (*V. Wormskjoldi*) may occur, likewise, in the European var. *australis* or *lasiocarpa* (*V. pumila*). Devold & Scholander quote Coste, in his Flore de la France, who described the plant of the Pyrenees, the Jura, the Alps, the Auvergne and Corsica: "Plante vivace de 5–15 cm., poilue-glanduleuse dans de haut, . . . celle-ci

[capsule] bien plus long que le calice poilue-glanduleuse." They characterize Coste's description as "due to a mistake," though they go on: "But it is not impossible that it is based on some glandular specimens of *V. Wormskjoldii* from Europe, so much the more as we have seen two specimens from the Pyrenées which are densely glandular pubescent, and which, accordingly, cannot with certainty be distinguished from *V. Wormskjoldii*."

Discussing true *V. alpina* (which they do not recognize as occurring in America, except in Greenland) and the European *V. pumila* (*V. alpina,* var. *australis* or *lasiocarpa*), the last quoted authors state that "The quite extensive material Scholander has seen from Scandinavia and Central Europe has absolutely convinced him that these two species are distinct. He has never seen intermediate forms and the geographical distribution is likewise convincing." Even though *V. alpina* and *V. pumila* may not be demonstrated to pass directly from one to the other it is important to remember that the glabrous-backed sepals of the former are sometimes too closely approached in plants of eastern North America which are otherwise good *V. Wormskjoldi.* Furthermore, when the late Dr. M. O. Malte got *V. alpina* at Port Burwell (southern entrance to Hudson Strait) he twice collected it mixed with var. *unalaschcensis* (*V. Wormskjoldi*), apparently without noting them as distinct species or even as varieties. These two grow together in eastern North America; and several collection from Greenland show them mixed. If, in the Pyrenees, the home of the "distinct" *V. pumila,* some specimens "are densely glandular pubescent, and . . . , accordingly, cannot with certainty be distinguished from *V. Wormskjoldii,*" we have little in the way of *absolute* specific and phytogeographic difference left. The repeated assertion that *V. Wormskjoldi* is a species because it "may reach a height of 30 cm." does not prove it a species; plenty of American plants with the characters of *V. Wormskjoldi* may be as small as *V. pumila.* If the latter in the Pyrenees may be so glandular that it cannot be separated from the former it seems to me that the two are not specifically distinct. PLATE 563, FIGS. 3 and 4 show *V. pumila* from southern Europe; PL. 564, FIGS. 1 and 2 show dwarf *V. Wormskjoldi* from Labrador. As "distinct" species they make a weak display; species, like ambition, "should be made of sterner stuff."

Although maintaining *Veronica Wormskjoldi* as a species, Hultén (p. 292) discreetly says: "In the Scandinavian material of *V. alpina*

Photo. W. H. Hodge

VERONICA ALPINA, var. TERRAE-NOVAE: FIG. 1, portion of TYPE, × 1; FIG. 2, axis of raceme, showing nonviscid pilosity, × 10; FIG. 3, fruiting raceme, × 2.

Photo. W. H. Hodge

VERONICA ALPINA, var. GEMINIFLORA: FIGS. 1 and 2, a single plant, × 1, from TYPE-SHEET; FIG. 3, fruiting raceme, × 1, from Yellowstone Park; FIG. 4, flowering raceme × 1, from Idaho; FIG. 5, calyx and capsule, × 10, from British Columbia.

and *V. alpina* var. *lasiocarpa* (= *pumila* All.) I found a few individuals with the same general appearance as *V. Wormskjoldii*, but lacking the glandular tips of the calyx- and capsule-hairs. This characteristic is the only one by which I can distinguish those specimens from *V. Wormskjoldii*, and I thus think that *V. Wormskjoldii* might as well be regarded as a variety (subspecies) of *V. alpina*." Although Hultén thought that *V. Wormskjoldi* "might as well be regarded as a variety of *V. alpina*," he maintained it as a species; although Scholander, as recorded by Devold & Scholander, was "absolutely convinced . . . that these two species [*V. alpina* and *V. pumila*] are distinct," Hultén treated them as varieties and recorded Scandinavian material of *V. alpina* var. *australis* or *lasiocarpa* (*V. pumila*) as differing from *V. Wormskjoldi* only in lack of glandular pubescence. Devold & Scholander, as already noted, found plants from the Pyrenees which they associated with *V. pumila* but "densely glandular pubescent, . . . which . . . cannot with certainty be distinguished from *V. Wormskjoldii*." Such observations merely accentuate that *V. alpina* is a circumpolar species with several well defined but not always separable varieties. Those who ignore such intergrading of characters will recognize six "species" in North America.

Var. **terrae-novae**, var. nov. (TAB. 565), caulibus subrigidis 1–2 dm. altis apice griseo-pilosis vel adpresso-villosis, villis plerumque eglandulosis; foliis firmis vix nigrescentibus ellipticis, imis oppositis, supernis alternatis vel oppositis valde reductis, mediis 3–7 mm. latis; racemis fructiferis ellipsoideis vel obovoideis 1–3.5 cm. longis 0.9–1.3 cm. crassis fructibus valde imbricatis; sepalis pilosis pilis plerumque vix glandulosis; capsulis ellipsoideo-obovoideis pallide brunneis sparse minuteque pilosis.—NEWFOUNDLAND: wet quartzite rocks and gravel along brook, Southwest Gulch, northeast of summit of Bard Harbor Hill, Highlands of St. John, August 22, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,965 (distributed as var. *unalaschcensis*).

At once distinguished by its mostly eglandular and chiefly incurving pubescence and by the pale-brown capsules. Var. *unalaschcensis*, with more spreading and more viscid pubescence, has the capsules (until weathered over winter) greenish- or bluish-black or fuscous. In the reduction of glandular hairs var. *terrae-novae* is as near to var. *australis* or *lasiocarpa* of Europe as to var. *unalaschcensis*, but var. *australis* has the capsules as dark as those of var. *unalaschcensis* and the pubescence of the inflorescence more conspicuous. Var. *terrae-*

novae, in its relationship to a European variety of *Veronica alpina*, is peculiarly interesting. Along the alpine and subalpine brooks of Bard Harbor Hill or in neighboring regions of northwestern Newfoundland there are many plants of Europe or representatives of European plants which in America are known only in Newfoundland.

Var. **geminiflora**, var. nov. (TAB. 566), caulibus subrigidis 1–4 dm. altis apice plus minusve glanduloso-pilosis; foliis plerumque oppositis 4–8-jugis, mediis superioribusque ovatis acutiusculis, majoribus 1–2.2 cm. latis; racemis deinde laxis 3–15 cm. longisque, floribus imis oppositis vel suboppositis (rariter alternatis); bracteis imis lanceolatis vel ovatis elongatis; pedicellis imis 2–10 mm. longis; calycibus 4–7 mm. longis capsulisque glanduloso-pilosis; stylo 0.75–1.5 mm. longo.—Rocky Mountains and adjacent ranges, southern Alberta and southern British Columbia to Colorado and Arizona. ALBERTA: Lake Louise, August 15, 1909, *Olson*. BRITISH COLUMBIA: Selkirk Mts., near Glacier, July 29, 1895, *Canby;* Snowsheds, Glacier, alt. 4100 feet, July 23, 1908, *Butters & Holway*, no. 380 (flowers more alternate than usual); Beaverfoot Mts., near Carbonate Draw, alt. 7800 ft., July 13, 1904, *C. H. Shaw*, no. 252; Prospector's Valley, alt. 6250 ft., July 15, 1907, *Butters & Holway*, no. 137. WYOMING: wet springy places, mountains north of Government Bridge on Buffalo River, August 6, 1901, *Merrill & Wilcox*, no. 1145; moist alpine parks, Medicine Bow Mts., Albany Co., July 30, 1900, *Aven Nelson*, no. 7843; moist meadow, alt. 8000 ft., Crazy Woman Creek, Shoshone National Forest, Park Co., July 14, 1937, *L. O. & R. P. Williams*, no. 3556; Union Pass, August 11, 1894, *Aven Nelson*, no. 831; east of Lacy's Creek, alt. 7500 ft., Yellowstone Park, August 10, 1897, *Rydberg & Bessey*, no. 4937. IDAHO: moist meadow, alt. 8700 ft., Teton Pass Mts., east of Victor, July 22, 1920, *Payson & Payson*, no. 2075. COLORADO: Ida Bell Mine, alt. 11,500 ft., Summit Co., August 8, 1917, *Clokey*, no. 2890; headwaters of Clear Creek and ridges east of Middle Park, 1861, *Parry*, no. 237; Seven Lakes, alt. 3500 m., July 4, 1901, *F. E. & E. S. Clements*, no. 320; Marshall Pass, alt. 11,500 feet, July 19, 1901, *C. F. Baker*, no. 507; alpine meadows, summit of North Park Range, Routt Co., August 8, 1903, *Goodding*, no. 1802; near Pagosa Peak, alt. 11,500 ft., August 6, 1899, *C. F. Baker*, no. 607 (TYPE in Gray Herb.); summit of Wolf Creek Pass., alt. 10,900 ft., San Juan Mts., Mineral Co., July 28, 1928, *Carl B. Wolf*, no. 3008; lake-margin, alt. 9000 ft., mountains east of Colona, August 29, 1920, *E. B. Payson*, no. 2348. UTAH: wet meadow, alt. 10,100 ft., ridge east of Stillwater Fork, Uintah Mts., Summit Co., July 17, 1926, *E. B. & L. B. Payson*, no. 5007; Cottonwood Cañon, alt. 9000 ft., July, 1869, *S. Watson*, no. 805; Big Cottonwood Cañon, Salt Lake Co., August, 1905, *O. A. Garrett;* grassy hummock in woods, alt. 10,200 ft., northeast of Paradise Park, northwestern Uintah Co., August 16, 1935, *E. H. Graham*, no. 10,035; open moist woods, alt. 11,250 ft., Mt. Emmons, Krebs Basin, Duchesne

Photo. W. H. Hodge

VERONICA ALPINA, var. ALTERNIFLORA: FIGS. 1 and 2, a single plant, × 1, from the TYPE-SHEET; FIG. 3, raceme, × 1, from California; FIG. 4, calyx and capsule, × 10, from plant in fig. 3.

Photo. W. H. Hodge

VERONICA ALPINA, var. CASCADENSIS: FIG. 1, portion of TYPE, × 1; FIG. 2, fruiting racemes, × 1, from Mt. Hood, Oregon: FIG. 3, calyx and capsule, × 10, from the type-region, Mt. Rainier, Washington.

Co., July 20, 1933, *F. J. Hermann*, no. 5131; meadows, alt. 10,500 ft., La Sal Mts., Grand Co., July 31, 1924, *Payson & Payson*, no. 4077. ARIZONA: Humphrey's Peak, 9000–12,000 ft., San Francisco Mt., August 7–10, 1898, *MacDougal*, no. 386.

In its characteristic development var. *geminiflora* is the coarsest of all the varieties of *Veronica alpina*, the stem being relatively stout and tall, the leaves large (the middle and upper ovate and acutish), mostly opposite, and the large-bracted raceme, with lower flowers paired or subopposite, lengthening up to 1.5 dm. Its sepals, too, are the longest in the species. In the western part of its range var. *geminiflora* is often mixed with var. *alterniflora* and seems to pass into it; in the northwestern border of its range (southern British Columbia to Oregon) there is some transition to var. *cascadensis*. In extreme subalpine areas it seems to merge into var. *unalaschcensis*.

Var. **alterniflora**, var. nov. (TAB. 567), caulibus gracilibus 1–3.3 dm. altis apice minute pilosis; foliis ellipticis vel oblongo-ovalibus obtusis vel apice rotundatis, imis mediisque oppositis majoribus 5–12 (–17) mm. latis, superioribus plerumque alternatis valde reductisque; racemis deinde laxis alternifloris ad 1.2 dm. longis, 0.5–1.2 cm. diametro valde interruptis 9–25-floris; pedicellis imis 3–8 mm. longis; calycibus 2.5–4 mm. longis acutis vel acutiusculis piloso-hispidulis, pilis plus minusve glandulosis; capsulis ellipticis vel anguste obovatis 2.5–4 mm. latis; stylo 1.5–3 mm. longo.—Selkirk Mts., British Columbia, to the Big Horn and Teton Mts., Wyoming, the Clover Mts., Nevada, and the Sierra Nevada, California. BRITISH COLUMBIA: alpine rivulet at 6600 ft., Prairie Hills, July 23, 1904, *H. Petersen*, no. 384; Mount Molar Creek, July 9, 1904, *J. Macoun*, no. 67,810. MONTANA: at 7000 ft., Bald Mt., southern Montana, July 21, 1880, *S. Watson*, no. 315. WYOMING: banks of South Tongue River, near mouth of Marcum Creek, alt. 8000 ft., Sheridan Co., June 24, 1936, *L. O. & Rua Williams*, no. 3093; borders of parks, Obsidian Creek, Yellowstone Park, July 24, 1899, *A. & E. Nelson*, no. 6087; wet soil, Teton Mts., July 26, 1901, *Merrill & Wilcox*, no. 1034. IDAHO: moist meadow, alt. 6400 ft., Cape Horn, Custer Co., August 6, 1916, *Macbride & Payson*, no. 3632 (TYPE in Gray Herb.); moist, mossy streambank at 7500 ft., Salmon River Mts., near Bonanza, Custer Co., July 25, 1916, *Macbride & Payson*, no. 3427; by alpine stream, head of Boulder Creek, at 9000 ft., Sawtooth National Forest, Blaine Co., August 6, 1937, *J. W. Thompson*, no. 14,113. OREGON: without specified locality, 1871, *E. Hall*, no. 383; brooksides, Crater Lake, Klamath Co., August 12, 1896, *Applegate*, no. 422. NEVADA: Clover Mts., alt. 9000 ft., September, 1868, *S. Watson*, no. 805. CALIFORNIA: dry sunny stream-bank, Lily Lake, Pine Creek, alt. 7000 ft., Warner Mts., Modoc Co., August 10, 1935, *L. C. Wheeler*, no. 3821 (transition

to var. *cascadensis*); Lassen Peak, August, 1882, *Mrs. R. M. Austin;* headwaters of Hat Creek, at 2120 m., Shasta Co., July 31 and August 1, 1911, *W. W. Eggleston*, no. 7395 (transition to var. *geminiflora*); Gilmore lake meadow, Tahoe, alt. 8500 ft., July 31, 1913, *Smiley*, no. 3771; Ebbett's Pass, alt. 8500 ft., 1863, *Brewer*, no. 8022; Mono Pass, alt. 10,000 ft., 1866, *Bolander*, no. 5048; head of Tuolumne, alt. 9000 ft., 1863, *Brewer*, no. 1764; open grassy ground, Tuolumne Meadows, alt. 8600 ft., Tuolumne Co., July 17, 1907, *R. A. Ware*, no. 2635C; Tuolumne Meadows along the river, alt. 8500 ft., Yosemite Park, August 13, 1916, *Smiley*, no. 751; meadows, Farewell Gap, alt. 10,400 ft., 1897, *Purpus*, no. 5236.

In its very slender fruiting raceme suggesting *Veronica humifusa* and *V. serpyllifolia*, but with the flowers, fruit, foliage and habit of the *V. alpina* series.

Var. **cascadensis**, var. nov. (TAB. 568), caulibus tenuibus flexuosis vel strictis 0.5–2 (–3) dm. altis apice glanduloso-hirtellis; foliis ellipticis vel ovalibus submembranaceis, apice obtusis, plerumque oppositis 3–5 (–6)-jugis, majoribus 7–17 mm. latis; racemis deinde laxis 3–18-floris 1–7(–9) cm. longis 1–1.4 cm. diametro, fructibus imis oppositis distantibus, superioribus subapproximatis; sepalis 2.5–4 mm. longis obtusis pilosis; capsulis plus minusve pilosis elliptico-suborbicularibus vel late obovatis 4.5–5 mm. latis; stylo 1.5–3 mm. longis.—Coast Ranges of Alaska to Oregon, chiefly in the Cascade Mountains. ALASKA: at 3000 ft., Silver Bow Basin, Juneau, August 6, 1891, *Grace E. Cooley*. BRITISH COLUMBIA: alpine meadow, alt. 6000 ft., in the Big Bend District, lat. about 51° 45′, long. 118° 20′, July 22, 1905, *C. H. Shaw*, no. 937; Chilliwack Valley, alt. 4000 ft., July 9, 1901, *J. M. Macoun*, no. 54,504 in part (somewhat mixed with var. *geminiflora*); Clemenceau Creek Valley, alt. 7000 ft., July 16–Aug. 10, 1927, *A. J. Ostheimer, 3d*, nos. 97 and 117; sides and open grassy ravines, alt. 4000 ft., Mt. Arrowsmith, Vancouver Island, July 24, 1915, September, 1916, *W. R. Carter*. WASHINGTON: moist meadows near Lodge, at 4200 ft., Mt. Baker region, July 22 and 23, 1930, *J. W. Thompson*, no. 5272; delta above Bagley Lake, alt. 4300 ft., Mt. Baker region, Whatcom Co., August 14, 1930, *Thompson*, no. 5728; by alpine rivulets above Bagley Lake, Mt. Baker Lodge, Whatcom Co., August 19, 1931, *Thompson*, no. 8014 (6 individuals in the Gray Herbarium wholly typical, the 7th with unusually prolonged and alternate-fruited raceme suggesting the preceding variety, but with the broad capsules of this); wet bank of stream at 7500 ft., Mt. Stuart, Chelan Co., August 20, 1930, *Thompson*, no. 5838; Stevens Pass, alt. 3950 ft., Cascade Mts., August 9, 1893, *Sandberg & Leiberg*, no. 710; rich meadows at 6500 ft., Mt. Rainier, August, 1895, *Piper*, no. 2083; wet places, alt. 5500 ft., Mt. Rainier, August 10, 1897, *O. D. Allen*, no. 277 (TYPE in Gray Herb.). OREGON: Cascade Mts., 1859, *Lyall;* alpine slopes and meadows, Mt. Hood, August 1, 1924, *Henderson*, no. 941;

Elk Meadows, alt. 5000 ft., Mt. Hood, July 22, 1928, *J. W. Thompson*, no. 5055 (unusually tall, up to 3 dm.); mountain meadow at 6000 ft., Hunt's Cove, 4 miles south of Mt. Jefferson, August 14, 1919, *J. C. Nelson*, no. 2823; shady bank of Paulina Creek, near Paulina Lake, Crook Co., July 26, 1920, *M. E. Peck*, no. 9662; black hemlock forest, Crater Lake National Park, July 20, 1918, *Heller*, no. 13,048; Union Co., 1878, *Cusick*.

Var. *cascadensis* apparently has very large flowers, but without knowledge of fresh material it is impossible to reach an accurate understanding either of color or true size of the corolla.

Explanation of Plates 563–568

Plate 563. Veronica alpina L., var. typica: fig. 1, flowering plant, showing relatively large corolla, × 1, from Upernavik, Greenland, July 14, 1929, *M. P. & R. T. Porsild;* fig. 2, glabrous capsule and glabrous but ciliate sepals, × 10, from S. Strom Fiord, West Greenland, August 1, 1923, *Ralph Robinson*.

V. alpina, var. australis Wahlenb. (Var. *lasiocarpa* Hartm.; *V. pumila* All.): fig. 3, plant, × 1, from Campvieil, Hautes-Pyrénées, août 1870, *Bordère;* fig. 4, villous sepals and capsule, × 10, from Col de la Madonna, Alpes Maritimes, *Bourgeau*, no. 208.

Plate 564. Veronica alpina L., var. unalaschcensis Cham. & Schlecht. (*V. Wormskjoldi* R. & S.): fig. 1, small plants, × 1, from south of Cape Mugford, Labrador, *A. E. Prosild*, no. 210; fig. 2, viscid-villous sepals and capsule, × 10, from *Porsild*, no. 210; fig. 3, fruit, showing barely pubescent sepals and capsule, × 10, from Hebron, Labrador, *Sornborger*, no. 17; fig. 4, mature (dehisced) fruit, showing barely pubescent sepals and capsule, × 10, from Tuckerman's Ravine, White Mts., New Hampshire, September 1, 1877, *Faxon*.

Plate 565. Veronica alpina L., var. terrae-novae, n. var., all figs. from the type, Bard Harbor Hill, Highlands of St. John, Newfoundland, *Fernald & Long*, no. 28,965: fig. 1, portion of plant, × 1; fig. 2, axis of raceme, to show nonviscid pilosity, × 10; fig. 3, fruiting raceme, × 2.

Plate 566. Veronica alpina L., var. geminiflora, n. var.: figs. 1 and 2, a single plant, × 1, from the type-sheet, near Pagosa Peak, Colorado, *C. F. Baker*, no. 607; fig. 3, inflorescence, × 1, from Yellowstone Park, *Rydberg & Bessey*, no. 4937; fig. 4, young inflorescence, × 1, from Teton Pass Mts., Idaho, *Payson & Payson*, no. 2075; fig. 5, large calyx and capsule, × 10, from Glacier, British Columbia, *Butters & Holway*, no. 380.

Plate 567. Veronica alpina L., var. alterniflora, n. var.: figs. 1 and 2, one of type-specimens, × 1, from Cape Horn, Custer County, Idaho, *Macbride & Payson*, no. 3632; fig. 3, summit of plant, × 1, from Farewell Gap, California, *Purpus*, no. 5236; fig. 4, characteristic short calyx and capsule, × 10, from *Purpus*, no. 5236.

Plate 568. Veronica alpina L., var. cascadensis, n. var.: fig. 1, portion of type, × 1, from Mt. Rainier, Washington, *O. D. Allen*, no. 277; fig. 2, fruiting racemes, × 1, from Mt. Hood, Oregon, *Henderson*, no. 941; fig. 3, characteristic short sepals and broad capsule, × 10, from Mt. Rainier, Washington, *Piper*, no. 2083.

Solidago gigantea Ait., var. **leiophylla**, nom. nov. *S. serotina* Ait. Hort. Kew. iii. 211 (1789), not Retz. Obs. ii. 26 (1781).

Although Mackenzie, in Small, Man. 1359 (1933), took up *Solidago*

serotina Retzius in the place of *S. serotina* Aiton (independently published as a different species) there is every probability that the two had nothing to do with one another. *S. serotina* Ait. is the tall (up to 2.5 m. high) glabrous plant of alluvium and rich thickets, with very erect and glaucous stem, numerous lanceolate to narrowly oblong strongly ascending glabrous leaves, large terminal secund panicle, the heads with several ligules and numerous disk-corollas. *S. serotina* Retz. was well described: *stems 2–3 feet high,* somewhat *flexuous; leaves deflexed;* heads forming a terminal raceme, secund in leafy fascicles of 3–6; ligules 4, rarely 5; disk-corollas 3–5; and Retzius stated that some of the flowers become white on drying, so that the dried flowers are of two colors. All attempts to locate an authentic specimen of the species of Retzius have failed; but surely a plant with somewhat flexuous low stems, with deflexed leaves, and with leafy fascicles of 3–6 heads having only 3–5 disk-corollas (strongly suggesting *S. caesia* L.) is not the same as *S. serotina* Aiton. The latter name (1789) is, therefore, a later homonym and we are forced to take up in its place for the aggregate-species *S. gigantea* Ait. l. c. (1789).

Typical *Solidago gigantea* has the leaves pilose at least on the veins beneath, and the involucres 3.2–4 mm. high. It grows, usually, in less fertile soil than var. *leiophylla* (leaves glabrous on both sides, the involucres 3.5–5 mm. high) and has a more southerly extension, in the lower as well as the upland regions south to Florida, Alabama, Mississippi, Louisiana and Texas; var. *leiophylla* extending south in the richer valleys eastward only to the upland of North Carolina and Tennessee.

It seems safest to give a wholly new name to *Solidago serotina* Ait., treated as a variety, rather than to take up, perhaps erroneously, any of the names which by some have been placed in its synonymy. *S. glabra* Desf. Cat. Hort. Paris, ed. 3: 402 (1829), based on a garden plant cultivated in Paris, presumably belongs here. Material reputed to be it, from cultivated specimens now in the Gray Herbarium, is a very narrow-leaved form; but *S. glabra* Desf. (1829) was antedated by *S. glabra* Mill. (1768). Gray (Synop. Fl.) cites "*S. fragrans* Hort. Par., not Willd.," the name, published in synonymy and also a later homonym, quite inadmissible. *S. Pitcheri* Nutt. in Journ. Acad. Phil. vii. 101 (1834) has been referred to *S. serotina* Ait.; but, if it is this plant, it is not very typical. Nuttall's diagnosis emphasized the prominent serration of the leaves (foliis . . . argute serratis) and the small

Type of Pluchea camphorata (Erigeron camphoratum L.), courtesy of Mr. John Ramsbottom.

heads (parviflora), and he said "It has some affinity to *S. arguta;* its habit is that of *S. canadensis*, but its leaves are not conspicuously nerved." Gray noted upon a sheet of Geyer's no. 30 from St. Peter's River, an unusually broad-leaved specimen, "Nuttall's *S. Pitcheri* is just this, except that the heads are smaller, as small as in *canadensis*"; and in the Synoptical Flora, placing *S. Pitcheri* in the synonymy of *S. serotina* Ait., he characterized it as "with broad and comparatively short leaves and rather smaller heads." In view of the complexity of the plants of this alliance in "Arkansas" it is not safe to take up *S. Pitcheri* "foliis . . . oblongo-lanceolatis . . . argute serratis, panicula. . . parviflora" as quite identical with *S. serotina* Ait. "foliis lineari-lanceolatis . . . serratis triplinerviis."

THE IDENTITY OF PLUCHEA CAMPHORATA (PLATE 569). In the northeastern United States we have three species of *Pluchea:* (1) *P. foetida* (L.) DC., based on *Baccharis foetida* L., a perennial with sessile or broadly half-clasping leaves and with creamy-white flowers, extending from the southernmost states northward to southern New Jersey and southeastern Missouri; (2) a tarry-smelling annual with the oval to lanceolate sessile or very short-petioled leaves remotely to obscurely toothed or subentire, the corymb flat-topped, the very many-flowered involucres pilose, the corollas pink or purple, this species coastwise, chiefly in salt marsh or brackish soil or on coastal sands, northward to southern Maine, also in saline areas of interior New York and Michigan. This is the plant identified in Britton & Brown's Illustrated Flora, iii. 396 (1898) and in practically all subsequent works as *P. camphorata* (L.) DC., based on *Erigeron camphoratum* L.; (3) the annual or perennial with "catty" odor (sometimes said to be camphorlike, sometimes like that of the skunk, though John Clayton said of it "this whole plant hath á very strong and gratefúll scent"), the long-petioled lanceolate to lance-ovate and acuminate leaves copiously serrate with callous teeth, the terminal and lateral corymbs rounded, the involucres of the roseate flowers glabrous or merely granular on the back. This is *P. petiolata* Cassini or *P. viscida* (Raf.) House. It occurs in fresh (rarely brackish) marshes, shores and ditches from Florida to Texas, north to Maryland and to southern Ohio, Indiana, Illinois and Missouri.

Asa Gray, who had studied the types, did not separate as species our nos. 2 and 3; consequently, he correctly took up for the aggregate

species the earliest name, *Pluchea camphorata,* in the Synoptical Flora of North America assigning the habitat of no. 2, "Salt marshes and moist saline soil, Mass. to Florida, Texas, Arizona, and coast of California," but adding the partially clarifying note: "in shady places or less saline soil, with leaves thinner and more petioled, and involucre almost glabrous, when it is *P. petiolata,* Cass."

Gray's treatment would have been nearer to the situation as we now understand it if he had reversed his two phrases and had given the note on *P. petiolata* as indicating the habitat and characters of true *P. camphorata* and had then said that in salt marshes and moist saline soil the sessile-leaved plant with pilose involucres is *P. marylandica* (Michx.) Cassini; for the type and only plant concerned in the typification of *Pluchea camphorata* is quite characteristic *P. petiolata* Cass. or *P. viscida* (Raf.) House.

Pluchea camphorata rests upon *Erigeron camphoratum* L. Sp. Pl. ed. 2: 1212 (1763). The Linnean treatment was unusually definite and free from complication.

camphoratum. 14. ERIGERON foliis lanceolato-ovatis villosis: serraturis apice cartilagineis. *Hort. ups.* 259. *Gron. virg.* 122.
Baccharis foliis ovato-lanceolatis serratis, caule herbaceo. *Gron. virg.* I. p. 97 [error for 96].
Habitat in Virginia. ⊙.

Except for the reference to his own Hortus Upsaliensis (1748) Linnaeus, it will be noted, referred only to Gronovius, to page 96 of ed. 1 (1739), to page 122 of ed. 2 (1762). The treatment in Hortus Upsaliensis was as follows:

4. ERIGERON foliis lanceolato ovatis villosis serraturis apice cartilagineis.
Baccharis foliis ovato-lanceolatis serratis, caule herbaceo. *Gron. virg.* 96
Habitat in *Virginia.*
Hospitatur in *Caldario, & Tepidario,* annua.
Obs. *Herba odore camphorato suaveolens.*

Following back to the original account of Clayton's no. 165 by Gronovius it becomes evident that Linnaeus composed his diagnosis by adding a portion of Clayton's own description of his plant to that of Gronovius, unfortunately substituting "villosis" for Clayton's more accurate "mollibus." The original account by Gronovius read

B A C C H A R I S foliis ovato-lanceolatis serratis, caule herbaceo. Conyzae affinis floribus purpureis, foliis amplis integris viridi-fuscis mollibus odoratis. *Clayt. n.* 165.

On the sheet of no. 165 is the further comment, doubtless originating with Clayton: "Elechrysum with á soft red flower; this whole plant hath á very strong and gratefúll scent. D. Clayton ex Virginia num. 165." The photograph of Clayton's no. 165, type of *Erigeron camphoratum* L., consequently of *Pluchea camphorata* (L.) DC., for which I am indebted to Mr. John Ramsbottom, Keeper of Botany at the British Museum, is reproduced, × 4/5, as Plate 569. That it is a fragment from the summit of a plant of *P. petiolata* Cassini will be evident to those who know that plant.

The first available name for the salt-marsh plant with sessile or but short-petioled less toothed leaves, flat-topped corymbs and pilose involucres (our no. 2) seems to be Pluchea marilandica [as *marylandica*] (Michx.) Cassini in Dict. Sci. Nat. xlii. (1826), based on *Conyza marilandica* Michx. Fl. Bor.-Am. ii. 126 (1803).

Ranunculus lapponicus in Aroostook County, Maine.—On June 28, 1935, a one-leaved, small-flowered *Ranunculus* was collected near Mapleton, Maine, and sent to Prof. M. L. Fernald for identification. He pronounced the plant *Ranunculus lapponicus* L., and informed me that this subarctic species had never before been collected in eastern America south of central Labrador.[1] This plant has subsequently been observed at other points in the Aroostook Basin. To date none have been seen north of the Aroostook system but one station was located in Perham, on the northern limit of the system, very close to the St. John watershed and doubtless it occurs there.

In this region the plant seems to be restricted to more or less heavily wooded bogs, growing in sphagnum. In none of the stations could it be called abundant, but appearing in small, inconspicuous patches. A specimen has been deposited in the Herbarium of The New England Botanical Club.—G. D. Chamberlain, Presque Isle High School, Presque Isle, Maine.

The Legumes of Wisconsin.—The extremely large family of the *Leguminosae* is represented by 27 genera in Wisconsin, according to Dr. Fassett, author of a recently published study of the *Leguminosae* of that

[1] Subsequently found localized in Rimouski County, Quebec (See Wynne-Edwards in Trans. Roy. Soc. Can. ser. 3, sect. 5, xxx. 20 (1937).

state.[1] The work is a well-bound, well-printed octavo volume with 24 plates, 60 figures, 97 maps and numerous keys. The treatment is, we presume, one of a series which ultimately will compose a flora of Wisconsin. Two groups of maps, one showing the range of certain species throughout North America, and the other indicating their distribution in Wisconsin, have been prepared with considerable care and will undoubtedly become valuable references in future studies on the Wisconsin flora as well as in works of broader geographical scope.

The ". . . Key . . . Based on Vegetative Characters" seems fairly well constructed and usable. In one case, however, a statement is made which is not in accordance with observations made on the author's own collections. On page 7, in the key—PP, *Desmodium acuminatum*, *D. nudiflorum* and their varieties are separated from three other species by the character "stipels absent." It has long been the opinion of the reviewer that the usual absence of the stipels in mature specimens of these two species is due to their early-deciduous character and not to their actual absence. In checking the Wisconsin material of *Desmodium nudiflorum* and its varieties, stipels were found on *N. C. Fassett* no. 18566 and no. 16735 from Wisconsin (in Gray Herb.), as well as on other specimens.

For the most part, the genera represented by several species or those which are particularly difficult taxonomically have generic diagnoses, good keys to the species, or critical discussions. In the case of *Cassia*, however, the author has made a very confusing error. On page 23, in the diagnosis of this genus, is the statement "leaves odd-pinnate" and on page 25 are drawings of *C. marilandica* and *C. fasciculata* showing them (correctly) with abruptly pinnate leaves. This kind of misstatement in a reference text is very disconcerting.

The discussions under the individual species, in most cases composed of field observations and distributional notes, are usually interesting and helpful, although little that approaches critical treatment is presented and bibliographical citations are most obviously lacking.

The author has appended to the text a glossary of the technical terms used, which, unfortunately, we have found more original than accurate. In the adaptation of definitions from the works of other authors to the needs of this volume, which treats exclusively the members of the *Leguminosae*, the definitive essentials have not only frequently been lost but the terms, as defined, have not been so used in the text. For example, the author defines a compound leaf, categorically, as one "which is divided into several blades." From this it would follow that a leaflet is a blade of a compound leaf; however, the proposed definition for a leaflet is "a separate *blade-like* division of a compound leaf." It is not clear to the reviewer why a leaflet should be merely a "blade-*like* division" of a compound leaf, if that type of leaf is composed (as defined) of "*blades*." A similar discrepancy arises in the use of the word suture. A suture has been defined in a standard glossary, simply but clearly, as "a line of dehiscence." In this volume the author states that a suture is "the seam along the lower side of a pod, where the side walls are joined." Might one assume, then, that the fruits of the *Leguminosae* have only one suture? One might. On page 16, however, in the "Key Based on Fruits," under

[1] THE LEGUMINOUS PLANTS OF WISCONSIN (Illustrated) by NORMAN C. FASSETT. xii + [1] + 157 pp. The University of Wisconsin Press, Madison, Wisconsin. $3.00.

L, is the statement "*Sutures* pubescent. . ." and on page 130, in the treatment of *Amphicarpa bracteata*, "pubescence of the *lower* suture antrorse toward the base." One must assume, *now*, that there are two sutures.

Many of the definitions are quite incomplete, in that the definitive terms are wholly unexplained, yet they are used in the keys. One finds *style* defined as "the tapered distal portion of a pistil," but nowhere is the term *pistil* clarified. On page 39 two species of *Melilotus* are differentiated partly on characters of the ovary. If a standard definition for *style* were given (such as "the usually attenuated portion of the pistil connecting the stigma and ovary") and the terms *pistil*, *stigma* and *ovary* briefly and clearly explained, could not the student comprehend more easily the structure as well as the terminology? We would suggest, further, that in a future edition the definitions of *stipule*, *distal*, *proximal*, *elliptical* and *ovate* be revised. A glossary should present clear and concise explanations of technical words, and we can hardly accept some of the following as such:

"*Stipule.* A scale-like outgrowth, usually paired, at the base of a leaflet.
"*Distal.* Farther from the main stem.
"*Proximal.* Nearer to the main stem.
"*Elliptical.* Oblong, with rounded ends and nearly parallel sides.
"*Ovate.* With an outline like that of an egg, and the lower end downward."

Another appendix to the main text is the "Key Based on Epidermal Outgrowths."[1] This recension is the result, undoubtedly, of long and painstaking study and we should like to feel that ultimately it would prove to be of distinct taxonomic importance. A careful study of the key and explanation of it, however, places the student in a quandary immediately, because the terms gland, hair, prickle and trichome all are used in a manner suggesting a fine differentiation in application, yet in the glossary a trichome is defined while definitions of the other terms are conspicuous by their absence. As for the applicability of the key, the reviewer has looked in vain for the "green irridescence" (author's spelling) on the surface of the trichomes of *Cassia marilandica*, on the basis of which the author separates the genus *Cassia* of the *Caesalpinioideae* from *Amphicarpa*, *Dalea* and others of the *Papilionoideae*. The effort seems hardly worth while.

The plates illustrating the various "epidermal outgrowths" are simple line drawings, carefully executed and of considerable value taxonomically. Had the natural relationships in the *Leguminosae* been indicated, as they are exemplified by characters of vesture, we feel that a greater service would have been performed. The value of the artificial key is very obscure, whereas a key showing natural relationships would be of immeasurable value.

In conclusion, although we consider the textual material a definite addition to the knowledge of the *Leguminosae*, we feel that especially to be commended are the excellent photographs, the maps, and the very well executed line drawings. The photographs and drawings in themselves, will be of extreme aid in future study in the family and the text as a whole will be a useful general reference and supplement to more technical treatments.—B. G. Schubert.

[1] By Catherine Mose.

REDUCTION OF JUNCUS UTAHENSIS.—When this species was proposed (RHODORA **40**: 69. 1938), I was under the impression that its caudate seeds distinguished it from other members of *Ensifolii*. Dr. F. J. Hermann, examining the type of *J. Tracyi* Rydb., Fl. Rocky Mts. 155, 1061. 1917, found the mature seeds of that specimen to show well developed tails. A subsequent comparison of the two types leaves no doubt as to their being identical, and *J. utahensis* becomes a synonym of *J. Tracyi*. Rydberg made no mention of seeds in the description proper of *J. Tracyi*, but since one of the key characters of *Ensifolii* was "seeds apiculate," it is to be inferred that without examination he assumed that the seeds of *J. Tracyi* were like those of other members of its group, and it seems advisable to amplify Rydberg's diagnosis to include "seeds caudate."—ROBERT F. MARTIN, BUREAU OF PLANT INDUSTRY, WASHINGTON.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXVIII

LAST SURVIVORS IN THE FLORA OF TIDEWATER VIRGINIA

M. L. Fernald

(Plates 570–583)

Part I. Itinerary of Seven Field-trips

Continuing[1] our studies of the flora of southeastern Virginia, Mr. Bayard Long and I returned to Mrs. Bowman's at Century House, south of Petersburg, where we had found a good home and a convenient center from which to reach northward, southward and eastward on the Coastal Plain. A friend of the Gray Herbarium had established for the year a special fund for carrying forward this work and, although he most modestly requests that his name be withheld, he may be assured that his gift was carefully and, we believe, fruitfully enployed.[2]

Picking up the threads where we had left off in June, 1938, we worked steadily, in spite of heat and persecution by "chiggers," from

[1] For preceding papers in this series see Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189 (1935)—Contrib. Gray Herb. no. CVII; Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413 and 423–554 (1935)—Contrib. Gray Herb. no. CIX; Fernald, *Plants from the Outer Coastal Plain of Virginia*, Rhodora, xxxviii. 376–404 and 414–452 (1936)—Contrib. Gray Herb. no. CXV; *Local Plants of the Inner Coastal Plain of Southeastern Virginia*, Rhodora, xxxix. 321–366, 379–415, 433–459 and 465–491 (1937)—Contrib. Gray Herb. no. CXX; *Noteworthy Plants of Southeastern Virginia*, Rhodora, xl. 364–424, 434–459 and 467–485 (1938)—Contrib. Gray Herb. no. CXXIII.

[2] Part of the gift was used in support of Mr. Robert K. Godfrey's studies of his collections from the Coastal Plain of North Carolina, yet to be reported upon.

July 12th to the 23rd, with Robert Bowman driving us in his fine new car. Many spots which, earlier in the year, had been new to us were revisited and still longer familiar localities yielded much of interest. Thus, in the calcareous and fossiliferous areas of Surry County, and especially in the rich woods along the James at Eastover, a fine old plantation-home where we were cordially received (and invited to join a bathing party in the river), we renewed the discovery on the Coastal Plain of plants which belong more generally in the Piedmont or the Appalachian Valley or on the Blue Ridge or the Alleghenies: *Ptelea trifoliata*,[1] *Houstonia longifolia*, *Campanula americana* and *Senecio obovatus*, in addition to many reported in the last paper (of 1938). On the tidal shores of the James below Scotland (at the mouth of Crouch Creek) we had a thrilling half-day, for here was the long-sought *Aeschynomene virginica* (MAP 1), very young to be sure but a splendid find, because the species had apparently been unknown in the state since its original discovery by Clayton more than two centuries ago on the Rappahannock. Furthermore, the abundant material in fine flower and fruit subsequently collected here and farther up the James in August and September and again in August, 1939, at additional stations (one on the Chickahominy) shows conclusively that true *Aeschynomene virginica*, instead of being here near its northern limit, as we supposed, is, on the James, really at its *southern* limit. The plant of tidal shores in Virginia, Maryland, Delaware, southern New Jersey and southeastern Pennsylvania (dots on MAP 1), there centering on the tidal streams entering Chesapeake and Delaware Bays, is consistent in having larger leaves, flowers and fruits than the plant (range outlined on MAP 1) growing from Texas to southeastern North Carolina and there erroneously passing as *Ae. virginica*. The latter is apparently *Ae. hispida* Willd., by which name it was correctly known until in 1888 Britton (with the passive support of Stern and Poggenberg) incorrectly reduced it, without a word of explanation and without the bibliographic references which scholarship demands, to the northeastern *Ae. virginica*.

The two species are distinguished as follows:

AE. VIRGINICA (L.) BSP. Principal leaflets 1–2.5 cm. long; flowers 1.3–1.5 cm. long; legumes strongly torulose, 3.5–7 cm. long, with stipe 1–2.3 cm. long, the segments with thick and smooth (except for dark pustular trichomes) walls, the lowest segment 0.8–1.5 cm. long and 5–7 mm. broad; seeds 4.5–6 mm. long.

[1] As in the previous papers I omit the authors of names which are in Gray's Manual.

Ae. hispida Willd.? Principal leaflets 3–9 mm. long; flowers 7–9 mm. long; legumes barely torulose, 2–5 cm. long, with stipe 3–8 mm. long, the segments with thin walls puckered over the seed, the lowest segment 5–7 mm. long and 3–4.5 mm. broad; seeds 3–3.5 mm. long.

Whether the more southern species is truly *Aeschynomene hispida*, described by Willdenow from "America *borealis*," can be settled only by study of the Willdenow type, preserved at Berlin. Professors Diels and Pilger are most accommodating in studying for us types of critical species. In the present tragic state of trans-Atlantic transportation it is quite impossible to get a prompt report upon this type. The exact determination of the identity of *Ae. hispida* must, therefore, await a more favorable occasion. I have purposely omitted the Mexican material passing under this name from the map. The name there covers a complex series of specimens.

Close by was *Scirpus novae-angliae* (map 2), a typical plant of the coast of eastern Canada and New England, also found on the lower Delaware, but here at a new southern limit and a few rods away from a new northern station for the subtropical *Eleocharis albida* (map 3); and in the great swale back of the mouth of Crouch Creek *Carex hyalinopsis* Steud., a southern species previously unknown between North Carolina and southern New Jersey, was overripe but recognizable.

Farther to the northeast we tried for two days the Peninsula of Virginia and the Gloucester Peninsula. The former Peninsula was Grimes's territory, the latter was the region best known to John Clayton, who was clerk of the Gloucester court, unless, of course, he better knew his home-region in neighboring Mathews. It was, therefore, surprising to find many to us quite obvious plants which had not previously been noted in these areas, some of them reported for the first time so far north as Virginia only within five years. *Solidago pinetorum* Small abounded in the dry open woods and we subsequently trailed it at the margin of the Piedmont nearly to the Rappahannock. How it can have escaped notice until Small in 1903 described it from North Carolina is beyond our comprehension. *Sacciolepis striata*, a most distinctive grass, was locally abundant; *Rhynchospora caduca* Ell., one of the tallest and most beautiful of species, first detected north of the Carolinas at False Cape on the North Carolina border, in 1934, was abundant in swales near the highroad which Clayton must regularly have traveled between Mathews and Gloucester. The first piece of rich deciduous woods which we entered near Gloucester

Courthouse had a fine carpet of *Galium uniflorum* Michx., the pretty species with purple pulpy fruits which, in 1935, was recorded from Princess Anne as the first north of South Carolina. In a shallow film of water in the woods slightly south of Gloucester, near White Marsh, *Elvocharis tricostata* (MAP 4) abounds. When we found it in 1937 in Isle of Wight County, our station was the first known between Georgia and New Jersey. Yet it grows near the main highway between Gloucester Port and Gloucester Courthouse! On the border of the brackish marsh near the village of North (Mathews County) we had our introduction to European marsh mallow, *Althaea officinalis*. Here it is abundant and it was a gratification to handle it, for its name is familiar in our manuals, though neither Long nor I had ever met the plant. So far as I can find it is unrecorded from south of the ancient station on Long Island, New York.

Not far from Williamsburg, in a small pool in the woods toward Lee Hall, there is a fine series of all three species of *Proserpinaca*, *P. palustris*, *P. pectinata* (not seen by Grimes) and *P. intermedia* Mackenzie, new to Virginia. This pool well illustrates the problem of botanizing in southeastern Virginia. Every natural spot has to be investigated; one cannot safely pass one of them if he wishes to find all the plants. Doubtless Grimes passed this very place many times, but nothing specially called it to his attention. *Proserpinaca intermedia* is one of the puzzling plants. Clearly distinct from both *P. palustris* and *P. pectinata* it is sometimes thought to be a fertile hybrid of those two. It often occurs with them, as at this station. Again it is found quite by itself. Here is a beautiful opportunity for a cytologist to see what he can make of the situation.

It was not far from Lee Hall that we had one of our trying adventures. Between there and Yorktown lies the Naval Mine Depot, strongly guarded by a very high and durable steel-wire fence. Signs are abundantly displayed, warning of the explosives and dangers inside the fence. There is no temptation for the ordinary traveller to trespass; but suddenly we saw within the fence a *Paspalum* quite new to us (and to Virginia), with tall culms and a great inflorescence of scores of erect spikes. We couldn't scale the fence and didn't want to risk doing so, but we had to get the *Paspalum*. Finally, after vainly trying to reach it by thrusting the longest (middle) finger through a small aperture and yearningly wiggling it in the general direction of the haughty grass, we solved the problem. Long secured a crotched

branch which he managed to poke through an opening. Embracing a tall culm in the crotch he twisted and twisted, then jerked. We landed half an inflorescence, enough to settle the identity of the plant. Forced to be satisfied with that we regretfully drove on; and half-a-mile beyond our unsatisfactory poking within the Mine Depot we came to the grass outside the fence! It is only the introduced tropical *Paspalum Urvillei*, but, at least, we got real specimens; and in putting them up we were severely punished for our audacity, for the lower sheaths are heavily covered with disarticulating stiff bristles which sting like those of *Opuntia*, certainly a most unusual trait in a grass.

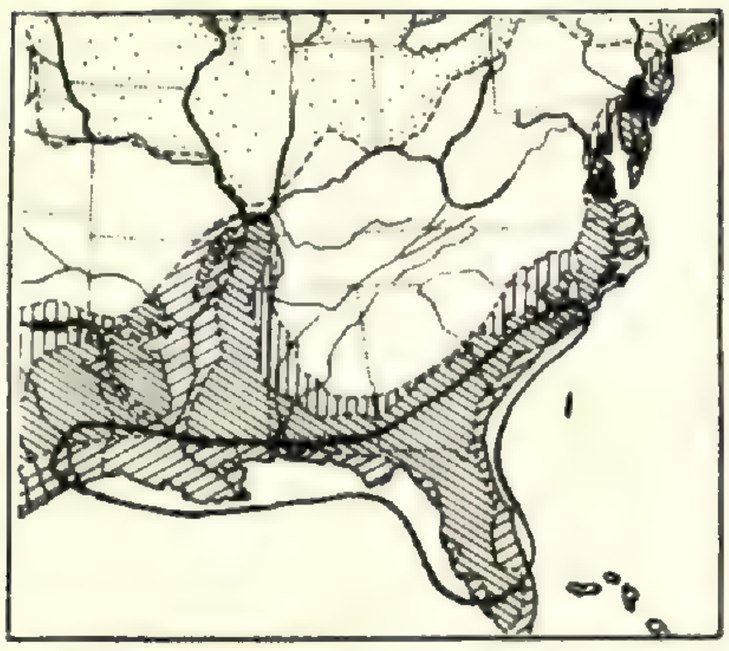
We had planned to return by driving up the Peninsula of Virginia to the Charles City ferry, but there had been heavy rains, the road was torn up and of very "slick" clay. Robert stuck gamely to the wheel until we came to an absolutely impassable tract of road, with numerous cars mired. Then we turned back and took the James City ferry. Looking up the point where we turned back we find by the map that we were slightly southeast of Hotwater. Luckily we kept out of that uncomfortable element.

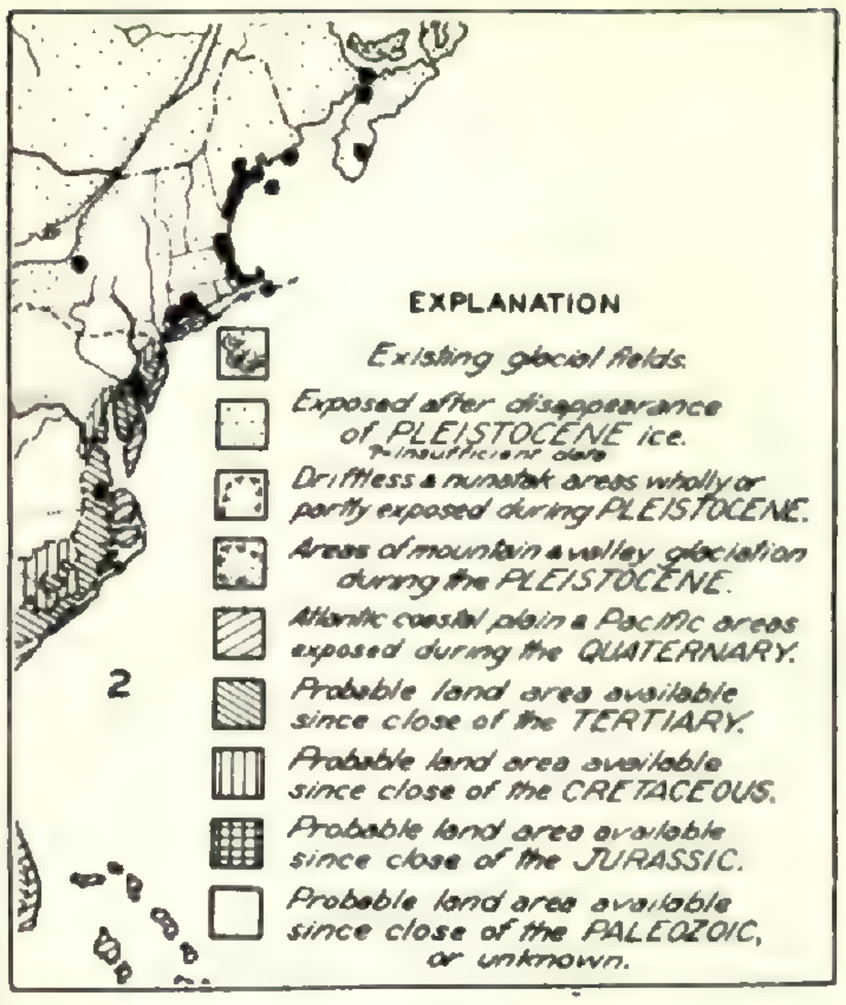
South, toward the Carolina line, we got new plants at old stations: *Hypericum adpressum* (MAP 5) abundant (new to the state) in the swampy borders of woods and clearings north of Stony Creek; *Buchnera americana* with *Panicum fusiforme* Hitchcock (first north of southern Georgia) south of Burgess, the *Buchnera* also abundant (with *Schwalbea americana*) on both sides of the line between Sussex and Greensville (south of Jarratt); *Chamaecyparis thyoides*, at perhaps the first (but not the last) station in the state known to botanists outside the Great Dismal Swamp, in wet woods bordering our pine barrens south of Franklin; the little known *Malaxis Bayardi* Fernald in dry pine and oak woods near Skipper's; *Sida rhombifolia* L., extended north from North Carolina, about Courtland; *Heterotheca subaxillaris*, not recorded between North Carolina and Maryland, about Franklin; *Polygonum pensylvanicum* var. *durum* Stanford (first north of South Carolina) in several fields. But two special areas, quite new to us, must suffice as further records of our July discoveries.

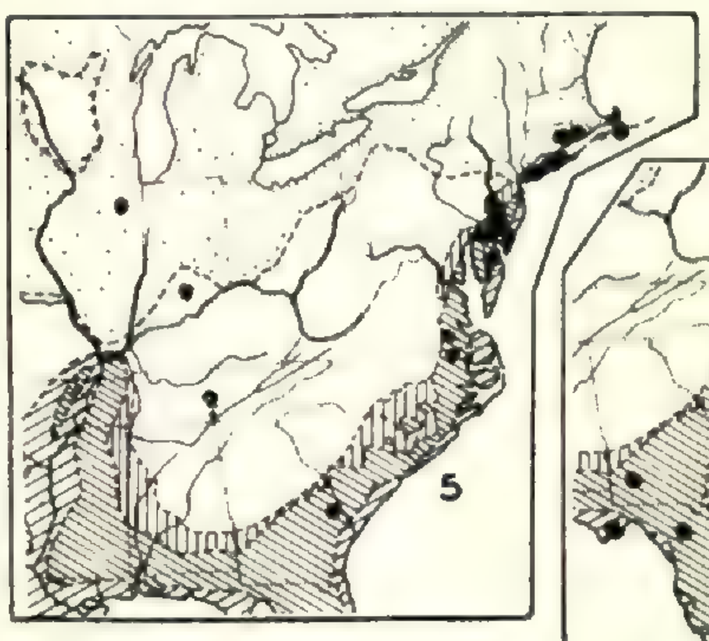
Grimes had found many good things (for instance *Parnassia asarifolia* of the mountains and *Chelone Cuthbertii* Small (*C. Grimesii* Weatherby) of the Blue Ridge of North Carolina) in the spring-fed bogs bordering Whiteoak Swamp, west of Elko Station in Henrico County. It was too early for *Parnassia* and *Chelone* but we went to

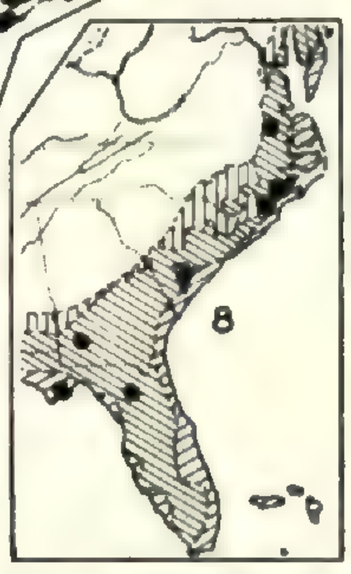
Elko the last of a very rainy afternoon to reconnoiter. I went west, Long east. I immediately came upon the little known and very definite *Thalictrum macrostylum* (Shuttlew.) Small, of the uplands, and saw that a month later the area would be a choice one. Long got into a springy sphagnum-carpeted magnolia swamp and brought back *Juncus caesariensis* Coville. Grimes had it near Williamsburg; but this station is many miles northwest of there and only the second outside the Pine Barrens of New Jersey.

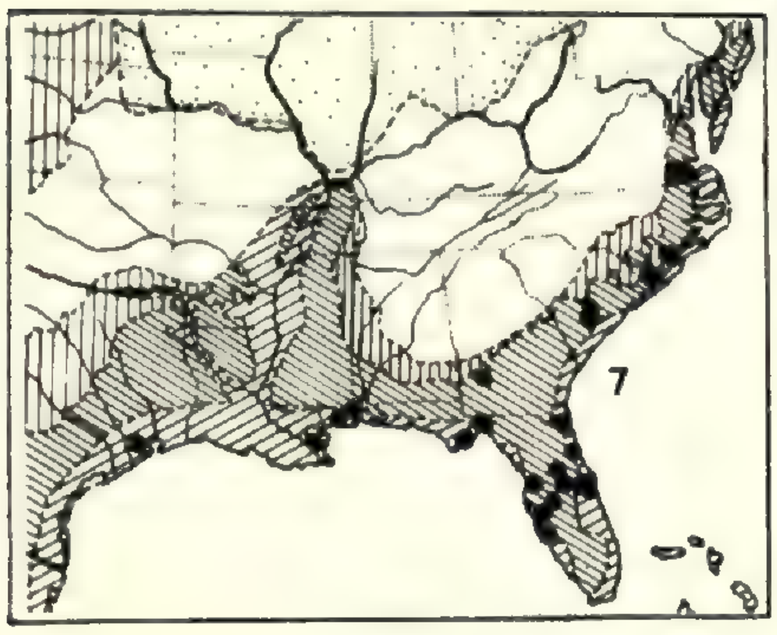
The last of our July stations was a gem: "The daintiest last, to make the end most sweet." At least a dozen times we had driven over the trunk-road between Emporia and the North Carolina line and we had taken side roads in search for a good bog. One afternoon in July, having stopped at the few uncultivated spots north and south of Skipper's, I remarked that if we were to find any more southern species extending into that corner of Virginia it must be "pronto"; we were within three miles of North Carolina. Despairing of finding unaltered spots, I started up a wood-road through a conventional wooded swamp. Long stayed near the car; but in two minutes I was calling for help. I had stumbled upon a beautiful little sphagnum bog and the first glance showed that our afternoon's work was begun. *Xyris* abounded; the one with broad spiraling leaves and large bulbs covered with short brown scales, *X. platylepis* Chapman, unknown from north of South Carolina, except that we had just got it north of Skipper's; the smallest species, the rare *X. Curtissii* Malme, which a few years ago was recorded from its first station north of Georgia. An old fruiting stem (only one, much dried) could belong only to the much-named *Zigadenus angustifolius* (Michx.) Watson (MAP 6). Occurring on the Coastal Plain from eastern Louisiana to Florida, thence, as we now know, to southeastern Virginia, the plant has relict colonies on the ancient Appalachian core of eastern North America. It is an ancient type still persisting. Originally put into *Helonias*, the species has been placed at times in *Amianthium*, which it superficially resembles, at times in *Zigadenus*, with which it shares the basal glands of the perianth. It is atypical in any of them and Small, with characteristic liberality, constitutes of it the newly proposed genus *Tracyanthus*. Whether it belongs to a new or an older genus, the species is obviously old. So far as we yet know there is a single small colony of it in Virginia, precariously close to a plowed field. The lower vegetation in the bog consisted of a nearly continuous

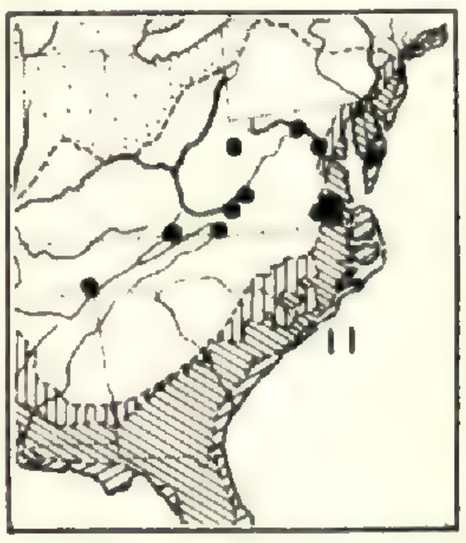


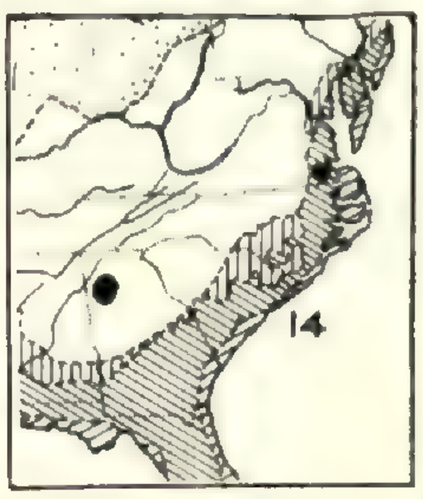


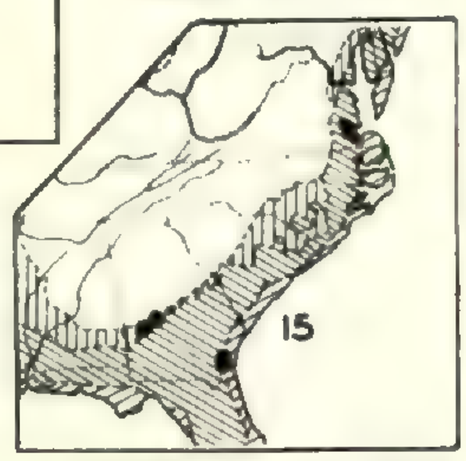


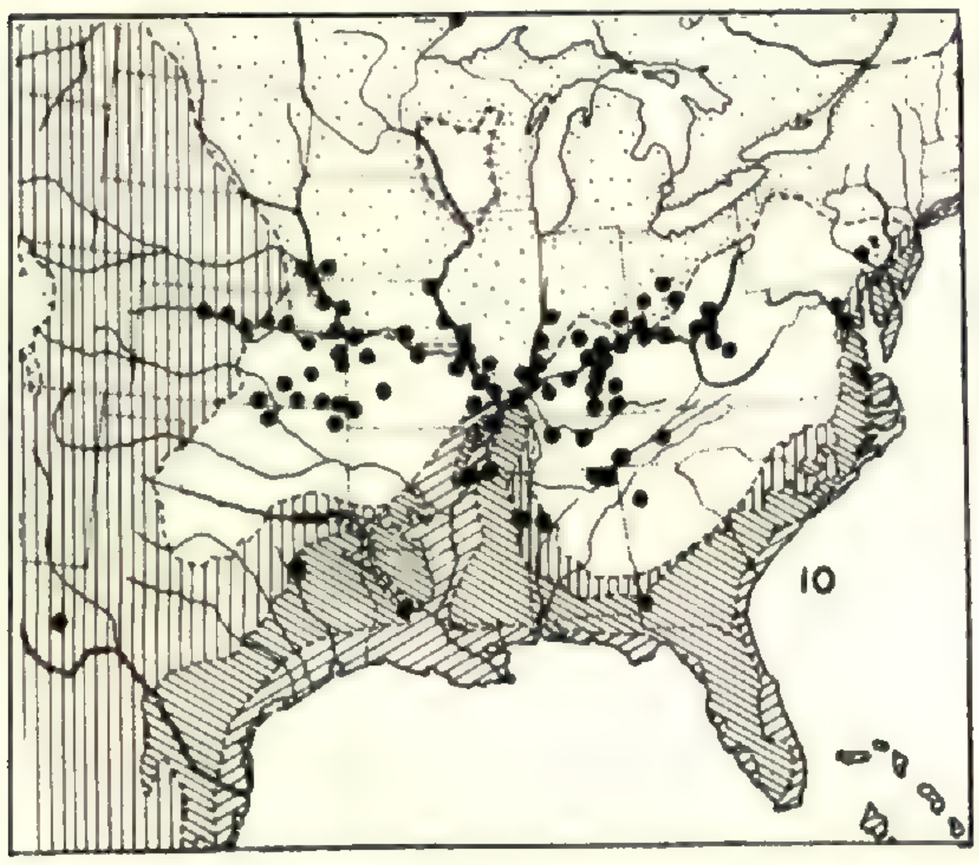












Ranges of, map 1, AESCHYNOMENE VIRGINICA (dots) and AE. HISPIDA (northeastern portion of range, below); map 2, SCIRPUS NOVAE-ANGLIAE; map 3, ELEOCHARIS ALBIDA (omitting Bermuda); map 4, ELEOCHARIS TRICOSTATA; map 5, HYPERICUM ADPRESSUM; map 6, ZIGADENUS ANGUSTIFOLIUS; map 7, BURMANNIA BIFLORA; map 8, OXYPOLIS TERNATA; map 9, CALAMOVILFA BREVIPILIS and 2 varieties (1 in Virginia, 1 in North Carolina); map 10, AMPELAMUS ALBIDUS; map 11, EUPATORIUM SESSILIFOLIUM, var. VASEYI; map 12, UTRICULARIA VIRGATULA; map 13, LILIUM CAROLINIANUM; map 14, GENTIANA CHEROKEENSIS; map 15, SCIRPUS FONTINALIS (Georgia) and its variety (Virginia).

carpet of *Lachnocaulon anceps*, with *Panicum strigosum*, *ensifolium* and the other species of sphagnous bogs; and the rarer *Ctenium aromaticum* was there; great clumps of *Xyris flexuosa* (*X. arenicola* Small) abounded, as did *Carphephorus tomentosus* (Michx.) T. & G., *Aletris aurea*, the usual orchids, the two regular species of *Sarracenia* and their hybrid × *S. Catesbaei*, *Rhexia ciliosa* in profusion, and all the things which give charm to a real (but now very rare) eastern Virginian bog. Suddenly Long shouted "See what's here!" There, under *Lachnocaulon* and *Panicum strigosum* was an unmistakable porcelain-blue flower, *Burmannia biflora* (MAP 7), based by Linnaeus on three tiny plants collected somewhere in Virginia by Clayton, and, except for an indefinite collection of Thomas Nuttall's, subsequently unknown in the state. Later visits, in August, September and October, yielded *Burmannia* in profusion. While searching for another flowering specimen (we were too early) I came upon an extraordinary plant, very slender, with two filiform petioles each terminated by two or three linear-oblanceolate leaflets, suggesting abnormally long donkey-ears. This was one of the rarest of all Umbellifers, *Oxypolis ternata* (Nutt.) Heller, described by Thomas Nuttall from somewhere in "bushy margins of swamps, in the pine forests of North and South Carolina" but known to the monographers of the family, Coulter & Rose, in 1900, only from Apalachicola, Florida! All the stations represented in the herbarium of the New York Botanical Garden and the Gray Herbarium can be counted on the fingers (only part of them); they are indicated on MAP 8. Long, with undisguised emotion, remarked, "This is the peppiest half-hour I've had for years." But "Brer Rabbit he lay low" and soon held up a fine lot of *Utricularia juncea*, real plants with character, not the nondescript specimens simulating *U. cornuta*, such as often puzzle New Jersey botanists. But it was Long who capped the climax by finding a small colony of the New Jersey Pine Barren *Calamovilfa brevipilis*, MAP 9 (only differing from the New Jersey plant in its smaller spikelets and in having the tips of the pedicels *epilis* instead of brevipilis). The only other variety of the species is a very rare plant of eastern North Carolina. These will be discussed in Part II. Thus, at the last moment, when we were on the point of giving up this particular route as worked out, we had found one of the choicest spots in all eastern Virginia (and in July of 1939 on the same road we found still another which we had unwittingly passed without detecting at least twenty times!). Not a trip has been

subsequently made to the state without calling in to see how fares our "sphagnous bog about 1 mile northwest of Dahlia." Even if nothing new is found it is a joy to see the great rarities again and to know that they are still living there.

During the August trip (14th to 25th) we promptly visited the springy sphagnous slopes and magnolia swamps near Elko Station and were surprised to find little *Xyris Curtissii* north of the James and to get *X. platylepis* which, a month earlier, had been found in Greensville County for the first time north of South Carolina. With the larger *Xyris* was *Carex Collinsii* Nutt., rare anywhere and unknown from Virginia until we found it in a bog of Sussex County. *Chelone Cuthbertii* of the Blue Ridge of the Carolinas was in splendid flower and very handsome, with rich purple corollas, and with it *Juncus caesariensis* of the New Jersey Pine Barrens was positively a common plant (much more abundant than our July observations had indicated); while the goldenrod with them proved (when flowering in September) to be typical *Solidago Elliottii* which, according to Mackenzie (in Small's Manual), had been known only from Parras Island in southeastern South Carolina; a good illustration of the mingled geographic relationships of the Coastal Plain flora. These were the high lights in late August, but along a siding near the station we gathered some good ruderals, especially *Euphorbia falcata* L., a European species apparently very rare in America, though collected some years ago, also along the Chesapeake and Ohio Railroad, by Steele in the western part of the state. It presumably follows this line across Virginia. *Chaenorrhinum minus* (*Linaria minor*) was likewise there (later found also along the Norfolk and Western, farther south), although Pennell gives its southern range in the United States as in Pennsylvania.

Somewhere north of Milford, in Caroline County, I thought I had seen from the swiftly speeding train indicators of a wet sphagnous slope. Accordingly, in spite of Long's skepticism, we went in search of it. Cross roads all the way from Woodford at the north to Bowling Green at the south were taken and miles of railroad followed in the extreme heat. We made the acquaintance of many workers along the track and of station attendants and small store-keepers. They all knew just the spot I meant, but endless following of their kindly suggestions failed to bring much to light. We were in the edge of the Piedmont and the typical Coastal Plain plants were "just not there."

A few species of the outer Piedmont as well as the Coastal Plain, like *Juncus Longii* Fernald and *Solidago pinetorum* Small, had their northern limits of range extended and we got *Najas gracillima*, whose known geographic limits have changed in every recent year; it now reaches south into Virginia! In one great area which ought to have been a good pine barren but which failed to live up to its outer appearance—dry sand and open pineland (of *Pinus virginiana*)—we were delighted to get into an extensive colony of the very rare and most distinctive *Desmodium ochroleucum*, with creamy-white flowers changing to yellowish, the fruits often spirally twisted and with some of the joints only obscurely articulated—morphologically unique among northeastern members of the genus. We were inclined to think its reputation for rarity may be due to its occurrence in areas otherwise too uninteresting to tempt a botanist! Even this discovery failed to elicit Long's comparison with other "peppy" half-hours. On this comparatively fruitless day some of our chief additions to the known flora of Virginia consisted of introduced ruderals on the railroad cinders, *Eragrostis poaeoides* and *Plantago indica* L.; while the range of *Chondrilla juncea* was extended somewhat to the south.

Another visit to the outer Piedmont showed us again very vividly how abruptly the concentrated Coastal Plain flora stops in its western extensions. Finding so many species out on the Coastal Plain but with relict or even their primary areas along the mountains, we had optimistically come to think that the outer Piedmont might perhaps share them. That this is not necessarily the case we found when we drove to Amelia Courthouse in Amelia County, to spend a very happy day with Mr. John B. Lewis, the alert and highly intelligent local naturalist. Mr. and Mrs. Lewis and their family and friends gave us a wonderful outing and Mr. Lewis took us to many choice spots. Only the merest suggestion of the Coastal Plain was apparent in the presence in one or two bogs of an occasional *Scleria* or *Rhynchospora* or of *Drosera capillaris* or *Lycopodium inundatum*, var. *adpressum* Chapm. The flora was preeminently of the Piedmont. *Crotonopsis elliptica* Willd. was new to me and to our Virginian experience but we subsequently got it on the Coastal Plain, and we were delighted to find the upland *Viburnum affine* Bush, var. *hypomalacum* Blake almost out to the Coastal Plain. But when we returned, in a few miles, from a country of two or three rare Rhynchosporas to one of twenty-five members of the genus our faith in the reality of the

Coastal Plain as a biogeographic unit was vastly strengthened! Mr. Lewis has been doing fine work in collecting the plants of Amelia; our day with him and his splendid family was an inspiration to us and we still talk of his keen knowledge of the local flora.

Back into the Coastal Plain again we proceeded, naturally, to get *Ampelamus albidus* (Nutt.) Britton of the Mississippi basin (MAP 10)! That was along the James, in Surry and Prince George Counties. At Jordan Point in the latter county it twines with the true southern and little collected white-flowered and narrow-leaved *Convolvulus sepium*, var. *repens* (see Tryon in RHODORA, xli. 421). They form a close tangle over the thickets there and, slightly below them, on the beach, *Aeschynomene virginica* occurs, the plant which so thrilled us when we got it in Surry County (p. 466). Standing in the tidal margin of the James, among the masses of *Sagittaria falcata* and other coarse plants of estuaries, there is a gigantic *Panicum*, a plant which, some years ago, had been secured over-ripe on one of the tidal creeks in Surry County. We now have good material awaiting a restudy of its section. Here also is our only station for *Rhynchospora macrostachya*. Farther north (on Cape Cod, for instance) it is typical of the most acid of quagmires and peaty pond-margins. Here, in brackish water, it seemed out of place; but we can't find it in the acid peats of southeastern Virginia, where the related *R. corniculata* abounds. Farther down river, in the Coastal Plain, we got the northern and inland *Lobelia siphilitica* along with *Campanula americana* and the other inland types, thus again demonstrating that, although the outer Piedmont is deficient in Coastal Plain types, the Coastal Plain, especially where lime prevails, is rich in inland species!

In July we had noticed that the ground nut, *Apios americana* Medikus (*A. tuberosa* Moench) occurs as two very distinct plants, one of them with dense and compact inflorescences rounded at summit (the wide-ranging and common plant); the other with lax and much prolonged tapering or spire-like inflorescences. In July the latter was too young to be convincing. Now, however, along the James in Surry County it was finely flowering; and our material from there forms the type of a well marked southern variety to be discussed in Part II. In previous seasons we had not seen *Rudbeckia fulgida* nor *Coreopsis tripteris*. Now, however (and in September), we had difficulty in avoiding them. They occur in the thickets in several counties; and their abundance where formerly we had not seen them

illustrates the importance of examining every habitat at every season! One year we found *Panicum Wrightianum* almost everywhere we went; in 1938 we did not once meet it. Well south of the James, once in Dinwiddie, once in Southampton, we came upon good colonies of the very definite *Eupatorium sessilifolium*, var. *Vaseyi* (Porter) Fern. & Grisc. (MAP 11) of the mountains of western Virginia, West Virginia and Lookout Mt., Tennessee. It is a striking plant with the familiar Appalachian-Coastal Plain split in its range.

East of Stony Creek, in the wet pinelands ("flat pinelands" of the Carolinians) where the boreal *Carex Buxbaumii* (northern Eurasia, Greenland to British Columbia, south, very rarely to Delaware, etc.) hobnobs with the more southern *C. Barrattii* (Connecticut to southern North Carolina, with rare upland stations in Tennessee and Alabama) and with *Juncus Elliottii* (Texas to Florida, north on the Coastal Plain to Delaware, with an isolated station in Coffee County, Tennessee) (see RHODORA, xl. 381), the water was now dried away and the pineland had a floor of almost impervious dry clay. The habitat was a bit discouraging in late August but, to our delight, it was at this season characterized by the rare southern *Manisuris rugosa* (Nutt.) Ktze., the grass with inflorescences resembling series of totem-poles. New to Virginia, the northernmost member of a tropical group, it shared the dried-out clay with *Panicum caerulescens*, a rare species more typical of the flats back of coastal dunes, a plant we had never before seen in Virginia.

August had been as hot as tradition makes it; the bogs had dried out to resistant clay-beds; the back roads had baked into almost impassable ruts. It was the most disagreeable season of the year and we looked with anticipation to September, when the nights would be cooler, the autumn-flowering groups would be developed and the "chiggers" perhaps all gone.

September proved what we anticipated. Unfortunately Robert's car was not adapted to the bad roads we needed to follow and Meade Lewis, whose car was not averse to rough roads, was permanently employed. So Mrs. Bowman secured us for September (15th to 22d) the services of an older man, incapacitated for strenuous work by serious wounds in the World War. He was by preference a squirrel-hunter. His unlimited anecdotes savored of squirrels, pool-rooms and a few war-incidents; but he knew the back country and proved a valuable help in taking us to good spots. Seeing that we had a

natural liking for wet pond-shores and bogs, he took us to such as could be reached, Long, coming to Petersburg by a new route, had spotted an open vegetation-carpeted shore north of the James, in Chesterfield County. Strickland knew just what he had seen and took us to the long-since drained millpond at the fall-line on Swift Creek, where, the dam having gone out, the once boomed bathing resort, Lakeview, had been deprived of its attraction and the shore vegetation had had its opportunity.

In the autumn of 1937, on the shores of a drained millpond in Southampton County, we were greatly excited by the botanizing and by the establishment there of new northern limits for such species as *Paspalum dissectum* and *Oldenlandia Boscii* (DC.) Chapm., the latter previously known only north to South Carolina; but we then little thought that a similarly drained millpond 45 miles to the north and beyond the James River would have the same vegetation. The residents of Lakeview, before the dam went out, had unconsciously been looking upon a colony of unusually interesting shore plants: carpets of *Eragrostis hypnoides*, *Oldenlandia Boscii*, and not merely *Paspalum dissectum* but, equally abundant and contrasting with it by its warm- instead of blue-green color and also extended north from Southampton County, *P. fluitans* (Ell.) Kunth. At one point another plant, *Hydrolea quadrivalvis*, also previously unrecorded from north of Southampton, was abundant, the tallest specimens we had ever seen. There has to be a limit somewhere, but we are anxiously awaiting notification of another broken mill-dam, to determine if these and their here unrecorded associates are the regular flora of derelict ponds throughout eastern Virginia.

The fossiliferous region of Surry County yielded additional and very extensive areas of thousands upon thousands of *Ponthieva racemosa* (Walt.) Mohr, which, although not known in Virginia before the last edition of Gray's Manual, we are coming to look upon as a frequent and abundant orchid of old calcareous woodlands; *Dirca palustris*, prevailingly a northern shrub, had its range in the Coastal Plain extended nearly to Isle of Wight County and in the old area of *Dirca*, the Canadian *Antennaria munda* and other localized species discussed in 1938, we found the northern and montane *Prenanthes altissima* pushing up out of the beds of southern *Ponthieva*. At Upper Brandon in Prince George County, another of the fine old estates on the James, we were given the opportunity to see an amazing

river-bank thicket and grove: ancient trees of *Celtis* (species to be discussed in a later paper) and the regular large trees of rich shores, with abundance of *Staphylea trifolia*, *Ptelea trifoliata* and other types of inland calcareous thickets; and the greatest development of *Bumelia lycioides*, var. *virginiana* Fernald we can imagine, a solid thicket of this spiny small tree (up to 4 or more meters high) so crowded with fruit that it was most difficult to make flattish specimens. *Albizzia Julibrissin*, "Mimosa", of Africa and southern Asia of course was there, as all along the lower James; and over this strange assemblage of continental American, southern Coastal Plain and oriental trees the English Ivy, *Hedera Helix*, formed a great festoon, climbing into the highest branches and there heavily flowering. It was difficult to remember that we were merely in "Old Virginia".

Wishing to get really good material of *Parnassia asarifolia* at Elko Station we returned there; *Parnassia* was beautifully flowering, in the sphagnum beneath alders and bay (*Magnolia*), and near by we were delighted to find a good colony of the very local *Helonias bullata*, a plant of southern New Jersey, where it is a neighbor of *Juncus caesariensis* (abounding here), and of the Blue Ridge, where it is a near neighbor of *Parnassia asarifolia*. These were in the general vicinity of the austral *Xyris platylepis* and *Solidago Elliottii* and the Blue Ridge *Chelone Cuthbertii* already noted. They made an impressive assemblage and we sought for index-species which might lead us to another such station. The formula which resulted, "find a thicket of *Alnus serrulata*, with *Sphagnum*, Marsh Fern, *Carex leptalea* and *Aster novi-belgii*", is not likely to give complete satisfaction. If it does, the deciding factors will doubtless include the cold springs which seep out where the superficial sands and peats meet the impervious clay underneath, with sufficient slope in the background and a great wooded swamp below. The sphagnous swales in September were glorious with *Lobelia glandulifera* (Gray) Small. We had got quite used to this beautiful species with large azure-blue corollas, but the thousands of fine plants at Elko with racemes up to 4.5 dm. long are worth going a great distance to see. The wet margin of Whiteoak Swamp gave us fruiting *Styrax americana*, probably at its northern limit, and near it was the northern and inland *Bidens comosa*.

So striking is the occurrence of typical montane plants here and elsewhere on the Coastal Plain that I am tempted to interrupt the narrative, in order to moralize upon some aspects of botanical observation.

In August, 1828, William Oakes, writing to his friend, Dr. James W. Robbins, said: "The greater part of July I have spent 'down East', even as far as Quoddy Head which lieth more eastward than Eastport. I have seen there however but few plants new to N[ew]. E[ngland]. & am convinced that no great accessions to the N. E. Flora, and of absolutely new plants hardly any, are to be expected from the State of Maine."[1] That was before my day, but as a school-boy I began the discovery in Maine of plants Oakes had never dreamed of and we now know from that state, so completely dismissed by Oakes from the botanical map, no less than 115 native species which are found nowhere else in New England.

In 1882, when the American Association met at Montreal, an excursion was made down the St. Lawrence and up the Saguenay. Reporting on this excursion through an area rich in endemics, an active botanist of the time said: "Probably the prevailing feeling among botanists at Montreal, from 'The States', was one of surprise and disappointment that the Canadian flora was so familiar. At Montreal I noticed nothing of interest."[2] In view of the amazing group of endemic species along the St. Lawrence above, at and below Montreal, one can only infer that the botanical visitors of 1882 were not inclined to get their shoes muddy.[3] The estuary of the St. Lawrence is now known to share with that of the Delaware great distinction for its endemic flora. Had the visitors from "The States" put on waterproof boots and gone to the shore near Montreal they would have seen an *Epilobium* which is almost not an *Epilobium*, because its seeds have no coma, and a *Bidens* which is almost not a *Bidens* because its achenes have no awns.

In 1884 the distinguished Canadian geologist, A. P. Low, describing one of the most impressive areas in Gaspé, wrote "The top of Mount Albert is nearly flat, and is rent by a deep gorge on the east, which,

[1] Wm. Oakes to J. W. Robbins in letter now at the Gray Herbarium.

[2] Quotation long ago noted, but source not identified.

[3] The fear of soiling one's shoes calls to mind an incident which may never have a better opportunity for recording. In the summer of 1903 I was visiting the distinguished paleobotanist, Graf zu Solms-Laubach, at his simple university professor's home in Strassburg. Count Solms was keenly interested (or politely seemed to be) in my Gaspé explorations and went so far as to say: "The Gaspé region is the one part of America which might induce me to cross the Atlantic. I want to see the stations where Logan got all those fossils." I naturally urged his joining me in the summer of 1904, for canoe- and camping-trips on the Gaspé rivers. But no! "It is impossible." But why, I asked, only to receive the same decisive negative. Upon my urging that he was a bachelor, without special family responsibilities, Count Solms finally explained: "I hear that in America you black your own boots. I couldn't sink so low as that."

near its head, splits into several smaller ones. The sides of these gorges are quite destitute of vegetation."[1] Determined to study the plants of an area "quite destitute of vegetation", my companions and I, in the past, have made three expeditions to the treeless gorges and walls of Mt. Albert and the flora which characterizes them is so unique that at least one botanist has crossed the Atlantic to investigate its components. In this, as in so many other cases, the flora is highly interesting but the "vegetation" has been thought to be lacking.

Now come nearer home, to Virginia. Similar sweeping generalizations, without crawling on hands-and-knees closely to inspect the smaller and most interesting plants, have been made regarding the flora of the Old Dominion. In mid-August and September of 1843 my distinguished predecessor, Asa Gray, accompanied by William S. Sullivant, undertook a reconnoisance of the mountains from northern Virginia southwestward. In a letter to Hooker, Gray outlined his route: "I leave home this afternoon for New York, on my way to the Alleghany Mountains in the north of Virginia, where I expect to meet my excellent friend Mr. Sullivant, of Ohio. We hope to trace the more westerly ranges of the mountains down to North Carolina and Tennessee, to revisit my old ground in Ashe County, etc., and to continue our journey farther south into Georgia, coming out at Augusta on the Savannah River; thence I may go to Charleston and return by water. But if time allows I shall perhaps run through upper Georgia and Alabama, to the Tennessee River, down that to the Ohio, and thence home."[2] That of course could not have been an intensive exploration of the flora in six weeks; and on September 30th Gray wrote to Torrey from Asheville: "I doubt if I got anything of much interest in Virginia," except four species specially noted; but the glories of the mountains around Asheville, North Carolina, were much emphasized, the botanical rarities including "a little clump of Schweinitzia . . . but . . . no more", *Buckleya*, *Stewartia pentagyna*, and *Parnassia asarifolia*. Gray little realized that in western Virginia, where he reported that he did not get "anything of much interest", all four of these specialties are found. Furthermore, he was not recording his impressions of Tidewater Virginia, where he did not botanize, and he certainly did not realize

[1] A. P. Low, Geol. and Nat. Hist. Surv. Canada, Rep. for 1882–84, 7F (1884).
[2] Jane Loring Gray, Letters of Asa Gray, i. 306 (1893).

that fine colonies of the Schweinitzia, the Stewartia and the Parnassia occur on the much neglected Coastal Plain of the state.

John Clayton, more than two centuries ago sent to Leiden from Tidewater Virginia, as well as from the Shenandoah Valley and points between, hundreds of specimens; and upon these, and earlier collections of Banister, Linnaeus based nearly 400 species of North American plants. After Clayton's time no consistent or long-continued study of the Tidewater region of the state was undertaken until Kearney's famous work on the Dismal Swamp area; and in 1909 one of the most active botanists of the extreme Southern States (Georgia, Florida and Alabama), knowing Virginia chiefly from the car-window, thus dismissed the flora of the Coastal Plain: "The pine-barrens of New Jersey and those of the southeastern states have been celebrated botanizing grounds for a century or more; but in the corresponding regions between the Delaware and Roanoke Rivers there seem to be very few typical pine-barren plants, or other species, which are not more common elsewhere. It is not surprising therefore that comparatively little has been published about this region."[1]

William Oakes disapproved of the state of Maine as the possible home of localized plants because, in his inexperience, he had made only a brief wagon-trip into the most sterile and glacially most denuded corner of the state. The botanists visiting Montreal and the estuary of the St. Lawrence in 1882 missed all the interesting natives because they did not go to the primitive and undisturbed habitats; any one seeing only the nibbled roadsides and the closely farmed or browsed clearings of Quebec would gain the same superficial impression. A. P. Low, looking in vain for what he considered "vegetation" in the ravines of Mt. Albert, completely missed the remarkable endemic and epibiotic species which there make up the flora. Asa Gray, trying in six weeks to cover the whole Appalachian region from northern Virginia to Alabama, and incidentally to take in Charleston and the Tennessee valley, could pick up only the obvious. Harper, riding across different sections of Tidewater Virginia chiefly by train, could not recognize *Burmannia*, *Hypoxis micrantha*, *Xyris Curtissii*, *Juncus caesariensis*, *Pyxidanthera*, *Eleocharis Lindheimeri*, *Juncus abortivus*, *Festuca paradoxa*, *Spiranthes ovalis*, *Oxypolis ternata* and the hundreds of other notable species which linger in isolated and rare spots which have escaped alteration by man.

[1] R. M. Harper in Torreya, ix. 217, 218 (1909).

Could we see eastern Virginia as it lay before Banister and Clayton there would be no dearth of botanically significant localities; but, unhappily for our reconstruction of the native flora as John Smith found it and as Banister and Clayton knew it, we have to work with almost insignificant remnants of the original flora. These are the lingering colonies, sometimes of a few individuals, sometimes patches a full rod in diameter, sometimes rare carpets of an acre or more, which, through the doubtful advantage that their tiny remnants of the ancient habitats are too wet or too dry for cultivation or otherwise not tempting as agricultural land, house-sites, hog-wallows and cow-pastures, have not yet been obliterated by man. To the great disadvantage of the original native flora of Tidewater Virginia man has there been altogether too progressive, not to say aggressive. Look at much of Norfolk County or the northeastern half of Nansemond County—mile after mile of closely farmed land, with scarcely a spot where conservative plants of specialized habitats can persist; and when a remnant of bog, too wet and sour for cultivation, is found, deep ditching has so lowered the water-table that the original rare plants have died out or hogs have been turned in because of the unlimited supply of water.

If we happen to belong to that excessively pragmatic group which sees value only in the economically profitable plants, the miles and miles of cotton-, tobacco- or peanut-fields, with their weed-floras of cocklebur, ragweed and Bermuda grass, will be wholly satisfying. If, perchance, we see interest only in the bulk-vegetation of aggressive or dominating species (those which hold their own in spite of man's activity) we shall be quite satisfied with the pastured woods of *Pinus Taeda* or *Quercus stellata* or *alba* and the pig-inhabited gum-swamps; and our greatest thrills will come in occasionally discovering a showy clump of cardinal-flower, wild azalea or lupine. If, however, we have a feeling for the real rarities we will pass the cardinal-flower and the lupine with a familiar nod and search for the more retiring and rarely seen species which to the layman are quite unknown. The reason is not simply the hunt for something others do not possess. To the scientist, whose mind has reconstructed the history of life in North America since the close of Permian time, roughly 100,000,000 years ago, every such plant fits into the picture and becomes a telling witness to the immutability of life in spite of perpetual destruction. In order to make my point clear let us review most briefly the story of our flora since the Permian.

It is generally recognized that many, if not all, the present great groups of flowering plants were well developed in Cretaceous time. So generally are remnants of many still-living groups found among early Cretaceous fossils that we are forced to the belief that they had come from ancestors of a still earlier period, presumably Permian or Jurassic; and many paleobotanists have even postulated a lost or unrecognized geological epoch in order to account for the sudden appearance in the Cretaceous of so many forms which cannot be traced back to recognized progenitors. Those who have reconstructed the Permian world show us two vast northern lands, Eria and Angara, with east-to-west seas separating them from southern Gondwana. By mid-Cretaceous time the Permian continents had become more broken: Australia (then expanded to include New Zealand) had become isolated from connection with other lands and the east-to-west median sea had severed, by a northward extension, North America into a northeastern mass, Laurentia, which connected by way of Greenland with Baltica and Angara and at the southwest terminated with the Appalachian and Ozark regions; and a western or Pacific land with a northwestern arc confluent with eastern Angara. At that time many groups now considered tropical or warm-temperate types were in the Arctic as well as on Australia, Ethiopia, Amazonia and the northern land-masses. Australia, early cut off from connection with other lands, shows the antiquity of its flora and fauna through the presence of a vast number of primitive groups and the absence of more modern types; on account of its archaic indigenous life Australia is often spoken of as "still in the Cretaceous".

Returning to North America, it becomes highly significant that on the southeastern portion of the continent we still retain a vast number of groups which in the Permian or the Cretaceous were in the Arctic but which also reached Australia before its severance from northern lands, while our opossum is our best known remnant of the ancient marsupials, which are so characteristic of the Australian fauna. Strikingly enough these groups, common to southeastern North America and ancient Amazonia, Ethiopia and Australia, are absent from the western half of the continent, the intrusion of the Cretaceous sea between eastern and western North America evidently cutting off the connection. We are, therefore, wholly justified in looking upon those groups which characterize Australia and eastern North America to the exclusion of western North America as relics, or at least de-

scendants, with us of the Cretaceous (perhaps Permian) life which radiated out of the North, eventually to spread to the antipodes.

Concentrating more closely upon eastern North America we find that the areas we call the Appalachian Upland and the Ozark Upland have been uninvaded by seas since the beginning of modern groups of plants and animals. While Cretaceous and then Tertiary seas occupied the lower levels bordering these ancient rock-cores and Pleistocene ice accumulated to the north, much of the Appalachian and Ozarkian cores remained uninvaded. In other words, these ancient cores have been areas for occupation by plants with no interruptions, except by uplifts, since the Permian and Cretaceous types first inhabited them.

This subject has been several times developed and I do not propose now further theoretical discussion of it. My present purpose is to call attention to the very large number of these last remnants of ancient floras which have moved out from the old Appalachian (or from the Ozark) axis into the Coastal Plain. In some cases, like *Liquidambar*, *Taxodium*, *Nyssa*, *Liriodendron* and *Sassafras*, there is absolutely no need of special protection or conservation. In spite of their great age and their dying out through geological time in much of the terrain they once occupied, they are still virile and, in case of Sassafras, even aggressive in our area.

Dramatically interesting and phylogenetically important as is this Mesozoic forest, still virile and dominating with us, it is with the rarer and rapidly dying and overlooked aristocrats in the flora of Tidewater Virginia that I am chiefly concerned. These are the plants so rare or so insignificant that only the trained students of a flora ever see them. It so happens that Asa Gray, expanding the range covered by his *Manual* in the 2nd edition (1856), made Virginia the southeastern state in the range. When the necessity to rewrite the *Manual* became unescapable I suggested the propriety of extending the northeastern limit to include Newfoundland, where I had prosecuted much field-work. This proposal met with objection because of the great number of additional plants to be considered. A check shows that they total 140 species and varieties. In the brief trips to the southeastern corner of the old manual-range, in Tidewater Virginia, during the six summers up to 1939 (the time in the field totaling 110 days or 3⅔ months) my companions and I have discovered 300 (at this writing fully 400) species new to the *Manual;* and at the present rate of such

discoveries we look forward to 300 more. Nevertheless, Virginia has not been dropped from the manual-range; Newfoundland has won a place in it. But "I digress"; we must return to the narrative.

The Greensville County localities again repaid visits. In the area slightly north of Emporia where *Schwalbea, Seymeria cassioides* and other local species occur, we saw fruits of *Chamaelirium luteum* projecting from the thicket. We had only once before seen it (in Sussex County) on the Coastal Plain. Strickland, making as quick a stop as possible, slowed down on the opposite side of the road—beside a colony of *Hypericum Drummondii*, a species chiefly of the Mississippi basin and the southwestern states, though once before reported from Virginia. At the Dahlia bog *Burmannia* was now mature and very attractive. A baffling series of variations or allies of *Juncus biflorus* forced itself on our attention; *Oxypolis ternata* was now in bloom and *Paspalum praecox* Walt., var. *Curtisianum* (Steud.) Vasey (*P. lentiferum* Lam.) was flowering, our only other Virginia station being in eastern Sussex. When, earlier in the season, we found the rare *Utricularia juncea* here we somewhat painstakingly prepared broad mats of the basal foliage and subterranean stems. Now, where *U. juncea* was flowering in July and August, thousands of freshly flowering needle-like stems of the excessively rare and tiny *U. virgatula* were standing! We do not know to which our mats of foliage belong (probably to both species); but this was only the second Virginian station for *U. virgatula* of Cuba, Florida, eastern Maryland, southern New Jersey and Long Island (MAP 12), the other being on the Eastern Shore.

Proceeding eastward from Skipper's we stopped at a partially overgrown clearing near Taylor's Millpond, there again finding *Hypericum Drummondii;* but the great prize was a fruiting plant of *Lilium carolinianum* (MAP 13), for, although known farther south on the Coastal Plain, *L. carolinianum* is preeminently a plant of the highest mountains (up to 5000 feet) from western Virginia to Alabama. Search failed to show another fruiting specimen (in October plenty of fine fruit was found at the border of dry woods near Skipper's and in June, 1939, we found a gigantic plant of it in Sussex County)[1]. Our last errand was to visit the bottomland of the Meherrin at Haley's Bridge, hoping the Acanthaceous plant which we got there in the spring would at last be in bloom. It certainly was blooming, some colonies

[1] In August, 1939, a fine station found in Prince George County.

with all the flowers cleistogamous, some with a few terminal petaliferous flowers, *Dicliptera brachiata* (Pursh) Spreng., the first colony known so far north as Virginia (except in Missouri).

The October trip (11 to 16) was necessarily a short one (taking advantage of Columbus Day and a long week-end). Mrs. Bowman had found a splendid driver and assistant for us, Leonard Birdsall, a keen young farmer, with previous experience in driving large truck-loads of produce north from Florida and bus-loads of school children through the back roads of Dinwiddie. Leonard at once comprehended what we were about and from his intimate knowledge of the farm-roads was able to take us to many choice spots about which otherwise we should never have known. Seeing how interested we were in the fossiliferous limy areas of Surry, he asked if we had ever visited the colonial marl-pits in Dinwiddie and Prince George. We never had, nor had we imagined lime-deposits near the surface there. When, after driving through circuitous and mystifying back roads, we left the car in dry pineland and walked toward what he assured us were marl-pockets of the early settlers, we wondered; but suddenly the oxylophytes gave way to rich vegetation including the northern red oak, (*Quercus rubra* of the manuals) and Leonard led us to the rims of the old pits, covered with colonies of such calcicolous specialties as *Aplectrum hyemale* and *Spiranthes ovalis!* Other such marl-pits, with the marl not visible at the surface, have subsequently been shown us. How the "old fellows" of colonial days knew the lime was there (deep underground) is a problem. Did they recognize the pronounced change in the vegetation?

The flat pineland east of Stony Creek had supplied a meagre but most interesting series of species at every season, beginning in June. We wanted to find an October specialty there; and we certainly succeeded. The open sphagnum-carpeted woods were now given over to a wonderful gentian, in its linear leaves and intense blue "closed" corollas suggesting the northern *G. linearis;* but at once differing in having minutely ciliolate calyx-lobes, jagged pleats as long as the corolla-lobes, and conspicuous dark bands extending from the tube up into the throat. It is a very striking member of the *G. Saponaria* series; best of all, it is an exact match for an isotype, generously presented by Dr. Pennell, of *Dasystephana cherokeensis* W. P. Lemmon, described as a very restricted endemic of the mountains of northwestern Georgia. It has not been found elsewhere, but

flat pineland of the Coastal Plain of Virginia, at least 400 miles northeast of the type-region of *Gentiana cherokeensis*,[1] is also very different terrain. Here is another addition (MAP 14) to the very considerable list, already reported, of this striking geographic segregation. The specific name was given, to use its author's words, because the species is "apparently restricted to the territory anciently occupied by the Cherokee Indians". Now, however, the "Cherokee Gentian" is likewise known in the ancient land of the Powhatan!

Gentiana cherokeensis was not the only discovery in the genus. In 1936 we found the slender plant, known as *G. Porphyrio*, in the border of pine woods south of Factory Hill. At that time we labeled and reported it as from Nansemond County, Virginia. Subsequently, fearing that the colony was probably a few rods over the line, in Gates County, North Carolina, we went to unscramble the confusion we had made. On the way, *north* of Factory Hill (most definitely in Virginia) we found a splendid group of the species and when we got to our old station, as definitely in North Carolina, we found *Aster spectabilis*, var. *suffultus* Fernald, a supposed eastern Virginian endemic, growing with it (of course new to North Carolina). But to return to *Gentiana Porphyrio* (name from the purple of porphyry), the name was given by J. F. Gmelin as a substitute for *G. purpurea* Walter, not L. Walter's diagnosis called for a bright purple infundibuliform corolla; while the plant erroneously called *G. Porphyrio* has an intense azure or indigo corolla with rotate limb. It certainly is not what Walter had; incidentally it must have a new name (see Part II). Best of all, at the border of the bottomland of the Meherrin and again in a peaty clearing in pineland near Branchville we did find a gentian with infundibuliform purple corollas. It is a rare plant but there is a sheet of it in the Gray Herbarium from Beaufort County at the southeastern corner of South Carolina (Walter's country). In it we at last doubtless have real *Gentiana Porphyrio!*

Throughout the summer we had sought in vain for *Drosera brevifolia;* from late June to September it had been invisible. Now, after heavy autumnal rains and the waning of the summer heat, with the welcome cool nights, peaty depressions suddenly became covered with brilliant new rosettes of the *Drosera.* Spots in Nansemond and in Dinwiddie, where we had thoroughly inspected the ground earlier in

[1] GENTIANA **cherokeensis** (W. P. Lemmon), comb. nov. *Dasystephana cherokeensis* W. P. Lemmon in Bartonia, no. 17: 4 (1935).

the season were now vivid with the small foliage; again an instance showing that negative evidence must be used with caution. And, whereas we had come to think of a single bog as the home of *Burmannia biflora*, we now found it somewhat farther north, and, in following a mossy woodroad more than 25 miles to the east, in Southampton County, we came upon a solitary stray individual. Its source in the latter county is not yet located.

After the scientific meetings at Richmond, where, in conversation, doubt was raised by Dr. Roland Harper as to the exact status of *Pinus palustris* (Long-leaf Pine) in Virginia, Long and I induced Mr. and Mrs. Donovan S. Correll to drive with us to Harper's supposed station (seen from a train). December 31st was spent in wading in ice-water, for fruit of the various gentians of the bogs and flat pine-lands. On New Years Day Long and I started to exhibit some of our choice habitats. Slowing down at our old parking-spot in the pine barrens south of Zuni, we were startled and grieved to hear Mrs. Correll announce: "Why, there's Long-leaf Pine right there!" And there it was! Intent on *Carphephorus*, *Polygonella polygama*, *Pyxidanthera*, *Juncus abortivus* and the other pine-barren herbs and low shrubs new to Virginia, we had half-a-dozen times brushed by the great columnar young pines without their "registering". Not only young columns were there; plenty of old fruiting trees occur. We have not yet got over our chagrin, for we promptly remembered Long-leaf Pine south of Cleopus in Nansemond County; we later collected it from specimens we had several times jostled in passing, south of Franklin in Southampton County; and in western Nansemond (near the Blackwater) we now have an area where it and *Chamaecyparis* are rapidly coming back after intensive cutting. Long and I can't jeer each other by mentioning Long-leaf Pine; that score is even! The mention of it simply makes us sad and humble.

The April recess, 1939, found us at Petersburg and Leonard on hand to help us (4th–9th). We knew that in early spring the rich woods and ravines would be most productive, fallow fields next, pine-lands and bogs without much, unless we could reinstate *Bartonia verna* in the flora of the state. Consequently we started for the rich calcareous woods toward the James. *Ranunculus micranthus* at once absorbed our interest. The little plant we know farther north has opaque and villous foliage, the unlobed radical leaves subtruncate to subcuneate at base. The plant of southeastern Virginia is lustrous-

green, with nearly glabrous unlobed basal leaves rounded to cordate at base, the plants relatively coarse and growing in deep calcareous woodland loam, instead of in thin films of soil about ledges. The southern plant matches Nuttall's type from Arkansas; the situation will be further discussed in Part II. *Aplectrum* was more frequent than we had ever seen it; in one piece of rich woods the rare and very early *Corallorhiza Wisteriana*, new to Virginia, was flowering; and on calcareous springy bottomlands *Cardamine Douglassii*, previously only a name to us, abounded, its purple to pinkish-white flowers decidedly earlier than the white flowers of *C. bulbosa*. *Nemophila microcalyx* proved to be common in rich woods, but *Phacelia dubia* has adopted bad practices; it is one of the regular early-spring weeds of fallow fields. Another weed, this time of lawns and grassland in the southernmost counties of Greensville and Southampton, is *Stellaria prostrata* Baldw. (*Alsine Baldwinii* Small), stated by Small to occur from "Fla. to Tex. and Ga." The residents of Emporia, Courtland and Franklin wish it would stay there. It forms dense, closely prostrate yellowish-green mats in the lawns, the slender fruiting calices upon maturity promptly disarticulating, leaving the naked pedicels. We were enthusiastically ridding the lawn at the courthouse in Courtland of this plant, "first north of Georgia," when a passing resident saw us and said: "What? You interested in that? Come over to my house and you can have a bushel of it. I won't charge you a cent, either!" We got plenty of it where we were and we did not take it all.

Another Caryophyll which greatly interested us was *Cerastium brachypodum:* "St. Louis, Mo. . . . to the Black Hills, S. Dakota . . . , westward and southward to Nevada, . . . Arizona, . . . New Mexico . . . and Louisiana" (*Robinson*, Synopt. Fl.); "Ga. to Tex., Ariz., S. D. and Ill." (*Small*). It grows at the margin of bottomland woods along Cattail Creek south of Burgess (Dinwiddie County). The plowing of a neighboring field has disturbed it, but it has not spread, like the aggressive *C. viscosum*, into the cultivated area. It looks like a case of the plow intruding upon it. At any rate, it is another first colony known north of Georgia.

In May (18th to 23rd) all the bushy clearings were golden with *Arnica acaulis* or *Senecio Smallii*. In shallow depressions the evasive *Drosera brevifolia* was beautifully flowering, the rotate corolla large for the genus, white and well over a centimeter broad; but one had to

be on hand in the forenoon to see it; its flowers close promptly at noon. At our old stations (reported a year ago) *Phlox carolina* L., var. *triflora* (Michx.) Wherry was flowering, and at a new station the hundreds of plants made the damp woods brilliant. It does not stop at 3 flowers; some of our specimens show ten times that number in a single corymb. In some fallow fields *Muscari racemosa* ("Bluebottle") was an abundant and obnoxious foul-smelling weed, while extreme large-flowered *Linaria canadensis*, var. *texana* (Scheele) Pennell, new to Virginia, could be traced by series of transitions into the ordinary small-flowered plant. *Specularia biflora*, known from Virginia only through a single old collection, was a regular occupant of many old fields, but we had great difficulty in finding petaliferous flowers; they were mostly cleistogamous. In one old fallow field near Skipper's, where the colored owner greatly enjoyed and encouraged our extermination of weeds, the lower plowed margin merges into an exsiccated argillaceous pond-hole. Here we crawled on hands-and-knees, to the edification of our host, scraping up films of fruiting *Callitriche deflexa*, var. *Austini* (which Griscom and I got for the first time in Virginia in Norfolk County), and collecting gigantic specimens of *Alopecurus carolinianus*, *Agrostis Elliottiana* (new to Virginia), *Sagina decumbens* and *Viola lanceolata*, var. *vittata* (the largest plant well covering an herbarium-sheet). A few plants of *Juncus secundus*, new to Virginia, were here, but they seemed rather discouraged.

While on the ruderal and weedy types, two species of *Cerastium*, found in Southampton County, should be mentioned. Stopping south of Franklin at the margin of the swampy woods bordering the pine barrens toward Smith's Ferry (really to renew the vain search for the still too shy *Bartonia verna*, but incidentally picking up *Carex Walteriana*, var. *brevis*, *Amianthium Muscaetoxicum* and *Kalmia angustifolia*, var. *caroliniana*) we slowed down on the soft shoulder. Stepping out, we found ourselves in a colony of a very strange roadside *Cerastium*. An annual, with very dichotomous inflorescences, its bracts end in long tufts of hairs. It proves to be the comparatively rare European *C. brachypetalum* Desportes, new to North America. Still another *Cerastium* new to North America abounds along the basement of a warehouse in Courtland. It immediately attracted our attention by its nearly glabrous stems and blue-green, blunt, elliptic leaves. It is *C. vulgatum*, var. *holosteoides* Fries. Just why Courtland, on the Southern Railroad, should be so rich a center for unusual

ruderal species we do not know. It is almost as good for a "peppy half-hour" as the region of the Norfolk & Western in Petersburg, and the weed-population of the two roads, both starting out of Norfolk, is different.

Now to the undisturbed habitats. The sphagnous bog northwest of Dahlia naturally won our prompt attention. There the most obvious sedge at this season was typical pubescent-fruited *Carex venusta*, known to Mackenzie (N. Am. Fl.) only from Florida to North Carolina. When we first collected it we took it to be var. *minor* (with glabrous fruits), which was now common in most sphagnous areas. Mackenzie treats the two as distinct species, in contrast to Francis Boott, Boeckeler, Bailey, Kükenthal and others who see only pubescent- and glabrous-fruited varieties. Our failure to see any difference until we got home and turned a lens on the Dahlia plant is significant! *Zigadenus angustifolius*, of which a single old fruiting scape was found the preceding July, was flowering but very scarce, only a few plants, in danger of intrusion by the plow. The plow, most unfortunately, had turned a strip about 20 feet wide on the upper edge of the bog, coming altogether too near some of the specialties. Later in the season, in June and July, it was evident that the farmer had found the land useless, very sour and wet, and the plowed strip is now an almost solid garden of *Lachnocaulon!* That at least survives; but a few more slices taken off the bog will finish *Burmannia biflora*, *Oxypolis ternata*, *Zigadenus angustifolius* and most of the other choice rarities.

During our somewhat hectic discovery in the autumn of 1938 of station after station for the new *Coreopsis oniscicarpa* Fernald in Rhodora, xl. 472, pl. 533 and 534 (1938), we had found a particularly nice colony along a seepy woodroad north of Dahlia. Thinking something else might be in so good a spot, we followed the woodroad; and there, in May, in the identical area where in October the orange-rayed and purple-black-centered *Coreopsis* abounded, we gazed upon a slender Composite with golden rays and dark center. Assuring each other that we were "all right" and not "seeing things," we discussed the phenomenon of the vernal flowering of autumnal species and particularly of the new *Coreopsis oniscicarpa*. Then, thinking it important to collect vernal specimens, we knelt in the colony. It wasn't *Coreopsis* at all, but the southern pineland *Helenium brevifolium* (Nutt.) Gray, new to Virginia! Even the rosettes of spatulate to linear-oblanceolate basal leaves are so like those of the *Coreopsis* that one has to look thrice to distinguish them.

At this season it seemed worth while to visit the old marl-pits east of Burgess Station. In May the area was a veritable garden, though the most significant plants were, paradoxically, relatively insignificant! The dominant *Carex* was *C. oxylepis*, little known in Virginia, forming great stools and very distinct in appearance, one of the few pilose-leaved species. *C. amphibola* Steud., new to Virginia, was with it and, of course, the ubiquitous *C. flaccosperma* which we once thought rare; and with them the very tall *Eleocharis tenuis*, var. *pseudoptera* (Weath.) Svenson, which had been known in Virginia only along the Potomac. And here, at last, on the rim of one of the old pits, where in October *Spiranthes ovalis* flowers, was the vernal calcicolous *Ophioglossum* in mature fruit. For some years we had been puzzled by the *Ophioglossum* which on the Coastal Plain of Virginia occurs in limy pockets and rich alluvium, with firm and highly lustrous sterile fronds, found from early April into May. Now, after repeatedly collecting it a little too young, we finally had good fruit. This collection forms the type of the southern variety to be described and illustrated in Part II.

One other day, the last to be here noted, we specialized upon two peculiar plants. In 1938 I reported (Rhodora, xl. 376, 381, 382 and 396) the discovery of a single area, about calcareous springheads in Surry County, of the little known *Scirpus fontinalis* Harper (map 15), a species otherwise known only about similar calcareous springheads in Georgia. Now, in May, we were delighted to find that it characterized probably all wooded springheads and bottomland woods in the area of exposed Miocene fossil-beds from Prince George southeastward through Surry. Our westernmost station is along Wall Creek in northern Prince George, our easternmost along College Run in northeastern Surry. Presumably it extends farther northeast and southwest. The very full series now at hand, in all stages from earliest flowering to dropping fruit, shows that, while the Virginia plant has all the crucial characters (narrow scales, long-beaked achenes, etc.) of the Georgian type, it consistently departs from it in the habit of the inflorescence. In Part II I shall set it off as a new variety. Occupying the same habitats and seen only there (or in rich calcareous woodland on Coggins Point) there was a giant *Myosotis*, with minute white flowers and very large fruiting-calyx. It was wholly new to us and its season is quickly over. On every calcareous bottomland, which we visited, it abounds. It must be highly

selective in its choice of habitats, for its glochidiate-bristly calices promptly drop off or catch on every passing trouser-leg. Yet it stays conservatively in the calcareous woods and on the bottomlands of creeks. It proves to be real *M. macrosperma* Engelm., previously represented in the Gray Herbarium only from Texas, Arkansas and southern Missouri. It and the Georgian *Scirpus fontinalis*, which shares with it the Miocene fossil-beds of southeastern Virginia, are appropriate species with which to close this section of the paper.

Many other significant species enumerated in Part II are here omitted for want of space. Furthermore, although it is a temptation to tell something of the 94 species new to Virginia discovered on trips in June and July, 1939, those, like many of earlier date, need more study; incidentally, field-work since May, when the special fund for Phytogeographic Research became exhausted, has been supported by a grant from the American Philosophical Society. This more recent work will form the basis for a later report.

Part II. Enumeration and Discussion of Noteworthy Species Collected

The following notes follow the plan of preceding papers, of recording such species and stations as seem to be significant in working out a fuller knowledge of the flora of the state and omitting the generally common species. Although primarily a record of collections made from July, 1938 through May, 1939, note is made of a few earlier and later collections when these are important in the presentation. The cost of field-work was defrayed through a Fund for Phytogeographic Research most generously given for the purpose by a friend of the Gray Herbarium. The cost of preparation of the plates by my assistant, Walter H. Hodge, has been met through an appropriation for personal research from the Division of Biology of Harvard University. The large expense of reproducing the photographs and the cost of extra paging has been most kindly defrayed by my companion on the trips and the actual discoverer of many of the rarities, Bayard Long. In case of our own collections it seems unnecessary to repeat the names of the collectors, *Fernald & Long*, except in the more critical discussions. As in previous notes plants thought to be new to the flora of Virginia are indicated by an asterisk (*). Many technical species collected await further study before they can be reported upon. Some of them will be discussed in later papers.

Dryopteris celsa (Wm. Palmer) Small. To the localities already noted add from Surry County: very abundant in rich deciduous woods 1½ miles east of Blizzard's Corners, no. 9235.

Asplenium platyneuron (L.) Oakes, var. bacculum-rubrum (Featherman) Fernald. Our northernmost station is in James City County: rich woods south of Hotwater, no. 8531.

Dennstaedtia punctilobula (Michx.) Moore. To the single Coastal Plain station previously reported in Surry County add from Henrico County: dry oak woods and clearings bordering Whiteoak Swamp, west of Elko Station, no. 9236. Sussex County: on base of large tree, wooded bottomland of Jones Hole Swamp, west of Coddyshore, no. 10,068.

*Ophioglossum vulgatum L., var. **pycnostichum**, var. nov. (tab. 570). Planta 1–3 dm. alta viridis; caule commune 4.5–13 cm. longo basi valde vaginato, vagina coriacea brunnea 3–7 mm. longa; lamina rotundo-ovata vel anguste ovata vel late lanceolata basi plerumque rotundata crassa lucida 2.5–8.5 cm. longa 1–4 cm. lata; sporangiis valde compressis transverse oblongis.—Rich calcareous woodlands, Maryland and District of Columbia to North Carolina and southern Indiana. Maryland: Woodside, Montgomery County, June 13, 1897 (overripe), *C. L. Pollard*. District of Columbia: in ravines near Dupont Heights, July 22, 1905, *Tidestrom*. Virginia: James City County: rich heavy soil in mixed woods, near Capitol Landing, 1½ miles northwest of Williamsburg, April 19, 1921 (nearly mature), *E. J. Grimes*, no. 3444. Surry County: wooded swamp east of Spring Grove, April 7, 1939 (immature), *Fernald & Long*, no. 9696. Prince George County: low deciduous woods about 1 mile northwest of Disputanta, April 6, 1938 (immature), *Fernald & Long*, no. 7744. Dinwiddie County: rich deciduous woods about old marl-pits east of Burgess Station, May 18 and 19, 1939 (mature), *Fernald & Long*, no. 9796 (type in Herb. Gray, isotype in Herb. Phil. Acad.). Sussex County: alluvial woods, Nottoway River, northeast of Lumberton, April 3, 1938 (immature), *Fernald & Long*, no. 7741. Southampton County: rich woods, Violet Hill, near Devil's Elbow, June 23, 1936 (overripe), *Fernald, Long & Smart*, no. 5587; rich loamy wooded slope near Hart's Bridge, southwest of Sunbeam, April 4, 1938 (immature), *Fernald & Long*, no. 7742; wooded bottomland of Blackwater River, southeast of Ivor, July 19, 1939, *Fernald & Long*, no. 10,471 (all sterile). Greensville County: bottomland woods by Metcalf Branch, east of Emporia, April 8, 1938 (nearly mature), *Fernald & Long*, no. 7743. North Carolina: moist open woods near Windsor, Bertie County, April 11, 1932 (immature), *E. J. Palmer*, no. 39,797. Ohio: Clermont County, May, 1873 (overripe, sporangia all dehisced), herb. *Chas. E. Faxon*. Indiana: "with sugar maple, sedge [red?] ash and *Botrychium obliquum*," Lowry's woods, Marshall County, May 26, 1933 (mature), *R. M. Kriebel*, no. 176. See p. 492.

The plant of calcareous rich woodlands of southeastern Virginia (to be looked for in all the Miocene marl-beds) is very unlike the plant of northern peaty meadows, wet sands and drier acid soils which erroneously passes in North America as typical *Ophioglossum vulgatum*. So impressed were we by the very early (April to June) development of the plant, its calcareous habitat, its dark-green, lustrous, mostly ovate sterile fronds, its transversely oblong crowded sporangia (FIGS. 7–9) and the persistent brown basal sheaths (FIGS. 2–6), that I turned with confidence for clarification to Dr. Clausen's Monograph.[1] There, however, only disappointment was met; Clausen sees nothing of importance in the varieties proposed within *O. vulgatum*, lumping them all, whether from Eurasia, the acid bogs, swales and sands of Canada and the Northern States, the calcareous woodlands of the Southern and Central States, or Mexico or Africa as one plant quite unworthy of any geographic segregation. Even the very definite *O. vulgatum*, var. *alaskanum* (E. G. Britton) C. Christensen, which is maintained not only by Christensen but by Hultén, who is likewise familiar with typical European *O. vulgatum*, is reduced outright by Clausen; and many other proposed species and varieties are swept into one undifferentiated mass. This easy and over-conservative viewpoint, which will not be indorsed by those who intimately know the plants in the field but by which troublesome old names are uncritically disregarded, is expressed as follows: "Various trivial forms and varieties, based largely upon size of plant and shape of sterile blade, have been described, but since they seem to represent normal variations of any local population of this species, they are not considered in this discussion" (Clausen, p. 124).

Typical Eurasian *Ophioglossum vulgatum* (PL. 571) seems not to occur in America. In some characters it is approached by var. *alaskanum*, in others by the plant of southern Canada and the Northern States, in others by the calcicolous var. *pycnostichum*. True *O. vulgatum* has a definite chartaceous or coriaceous sheath (FIGS. 1 and 3–7) surrounding the common stalk; its sterile frond is most often ovate or oval, with commonly rounded base, and described as pale- or yellowish-green and opaque; and its sporangia (FIGS. 8 and 9) are in outline suborbicular to quite round. It is well illustrated in many European plates, those which show the rhizome also picturing the

[1] Robert T. Clausen, *Monograph of the Ophioglossaceae*, Mem. Torr. Bot. Cl. xix. no. 2 (1938).

sheath surrounding the common stalk. See, for example, Smith & Sowerby, Engl. Bot. ii. t. 108 (1793); Syme, Engl. Bot. xii. t. 1835 (1886), where the description is perfectly clear: "the frond, with its base enveloped in an olive-brown stipule-like sheath"; and J. Britten, Europ. Ferns, opp. p. 185 (1880–82).

The common plant (pl. 572) of acid or subacid soils (often boggy meadows, swales or damp sands, but sometimes dry and more exposed habitats) from eastern Canada to Washington and rather generally in the Northern States has the common stalk naked at base (figs. 1 and 2, and 4–7), the pale and opaque sterile frond oblanceolate, narrowly obovate, elliptic or lanceolate, and usually tapering gradually to base. In these characters it is unlike most Eurasian plants (with basal sheath and usually more ovate frond rounded at base); but the plant of Canada and the Northern States has the suborbicular sporangia (figs. 8–10) much as in typical Eurasian *O. vulgatum*. It is beautifully shown in D. C. Eaton, Ferns N. Am. ii. t. lxxxi, figs. 1–4 (1880). The earliest name for our common oxylophytic plant with sheathless fronds is *O. pusillum* Raf. in Desv. Journ. Bot. sér. 2. iv. 273 (1814) (apparently overlooked by Clausen), described

"41. *Ophioglossum pusillum;* feuille glabre, lancéolée aiguë, petiolée; épi plus long que la feuille. *Pensylvanie* (deux à trois pouces.)"

At the same time Rafinesque published

"40. *Ophioglossum pubescens;* feuille pubescente. N. *Jersey*."

What the latter is I leave to New Jersey botanists; Clausen, who has been much in New Jersey, failed to clarify it (see his p. 164). But Rafinesque's *O. pusillum*, antedating (and therefore invalidating) *O. pusillum* Nutt. (1818), is also *O. Grayi* Beck, Bot. No. and Mid. U. S. 458 (1833) (name overlooked by Clausen). That, however, was a provisional name only and, therefore, invalid; incidentally it was inadequately described and only vaguely typified: "Dr. Gray has found 2 or 3 specimens of a fern which resembles this [the Nova Scotian *O. vulgatum*] in its specific characters, but is scarcely 2 inches high. It may prove on further examination to be a distinct species. If so, I would propose for it the name of *O. Grayi*."

As stated, a provisional name, like *Ophioglossum Grayi*, is illegitimate. Incidentally the description and typification are inadequate; and it is established by the data in the Gray Herbarium that the dwarf specimens referred to were sent to Gray from Exeter, Otsego

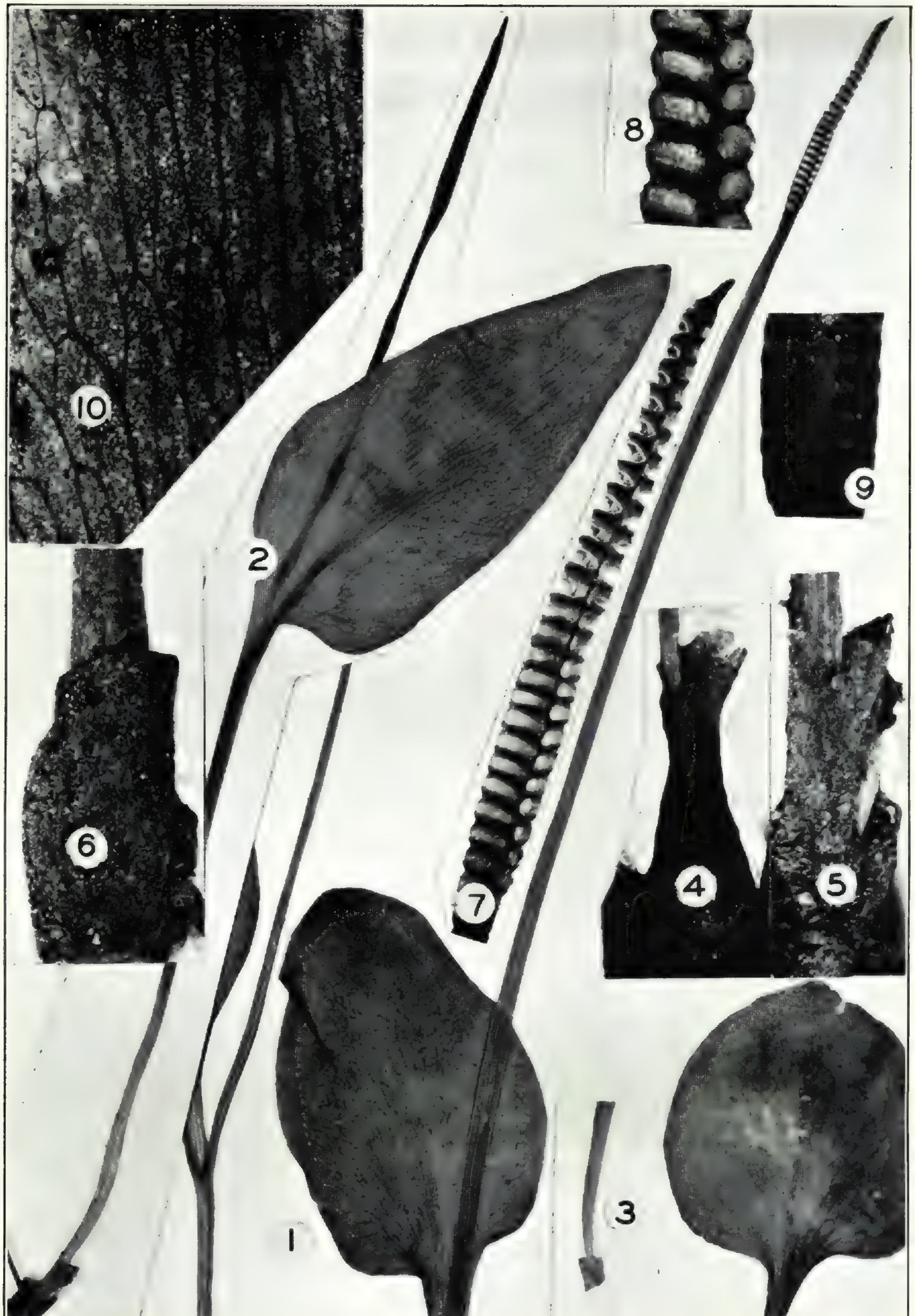


Photo. W. H. Hodge

OPHIOGLOSSUM VULGATUM, VAR. PYCNOSTICHUM: FIG. 1, TYPE, × 1, from east of Burgess Station, Virginia; FIG. 2, plant, × 1, from Capitol Landing, Virginia; FIG. 3, basal sheath, × 1, from the TYPE; FIG. 4, basal sheath, × 5, from Capitol Landing, Virginia; FIG. 5, basal sheath, × 5, from Marshall Township, Indiana; FIG. 6, basal sheath, × 5, from District of Columbia; FIG. 7, fruiting spike, × 3, from the TYPE; FIG. 8, mature sporangia, × 10, from Indiana; FIG. 9, immature sporangia, × 10, from District of Columbia; FIG. 10, venation of sterile segment, × 5 (by transmitted light), from Disputanta, Virginia.

Photo. W. H. Hodge

Ophioglossum vulgatum, typical var.: fig. 1 (including base at extreme left), portions of plant, × 1, from Austria; fig. 2, portion of plant, × 1, from Sweden; fig. 3, plant, × 1, from Scandinavia; fig. 4, basal sheath, × 5, from Austria; fig. 5, basal sheath, × 5, from Scandinavia; fig. 6, basal sheath, × 1, from Austria; fig. 7, basal sheath, × 5, from Japan; fig. 8, sporangia, × 10, from Austria; fig. 9, sporangia, × 10, from Sweden; fig. 10, venation of sterile segment, × 5, from Austria.

County, New York, by Dr. Curtis.[1] The name *O. Grayi* is wisely discarded. The dwarf specimens which Dr. Gray had and which he supplied to Beck are of the small extreme later properly described and illustrated as *O. arenarium* E. G. Britton in Bull. Torr. Bot. Cl. xxiv. 555, tt. 318 and 319, fig. 3 (1897). That this is only the most dwarfed extreme of our northern plant is now usually conceded. In 1911 slightly larger individuals from a swamp in Delaware County, Pennsylvania, with the sterile frond prolonged into a linear base, were described as *O. vulgatum,* var. *lanceolatum* Clute in Fern. Bull. xix. 72 (1911). This material is an extreme of the northern plant, but the name can not be maintained because of *O. vulgatum,* var. *lanceolatum* Luerss. (1878), an Australian plant which is included in *O. Prantlii*

[1] In ed. 1 of his Manual, 636 (1848), under *O. vulgatum,* Gray said: "A few immature specimens of a remarkably dwarf state, 1′–2′ high, with the young spike almost sessile, were gathered by Dr. Curtis, in Otsego county, New York." Somewhat earlier, thinking it a new species, he had given some to Beck and more of it to Torrey, with the suggestion that it was distinct from *O. vulgatum.* The following excerpt from Mrs. Britton's *Revision of the North American Species of Ophioglossum* (Bull. Torr. Bot. Cl. xxiv., especially pp. 546, 547 (1897)) is explanatory.

"In the Torrey Herbarium, unnamed, there is a sheet with six small immature specimens, two bearing fertile spikes and the following note by Dr. Gray:

Ophioglossum n. sp. I send you ½ I have and probably shall not be able to procure any more very soon. 15 to 20 specimens were found on a dry hill at Exeter (Otsego Co.) 12 of them in fruit. A few specimens are in the hands of a friend who first noticed it, Dr. Hadley has a specimen and I sent some to Beck 2 years ago (the same summer it was discovered). He has never given an opinion or said a word about it. I do not know that *O. vulgatum* or any other species has been found in this section. It appears to come near *O. pusillum* Nutt. but that species has 'frond cordate acute'—this has the frond *acute at the base* and obtuse at the extremity. These specimens are as large as any that have been found.

If you think it new suppose you publish it.

A. G."

Gray, it is obvious, was not at first and in his youthful inexperience content to place the plant of Otsego County with the Eurasian *Ophioglossum vulgatum,* a view in which he was entirely right! Still earlier Thomas Nuttall had expressed doubt about the identity of our plant with the European, in his Genera of North American Plants, ii. 248 (1818) describing his new *O. pusillum* and admitting a second species: "*O. vulgatum?* Frond oblong-ovate, obtuse, closely reticulated. Probably distinct from the European species." This healthy skepticism was soon overwhelmed by the weight of "authority" and, instead of seeing the actual differences, most later botanists have been content to overlook them, again illustrating the truth, that in critical taxonomic study inert ultraconservatism may be as misleading as alert radicalism!

C. Chr. (1906). Dr. S. F. Blake, without noting the fundamental characters which separate the American from the Eurasian plants of *O. vulgatum*, defined two leaf-forms of the former: forma *lanceolatum*, based on Clute's var. *lanceolatum* (already noted) and forma *pseudopodum* Blake in Rhodora, xv. 87, fig. 1 (1913), typified by a collection from New Hampshire with unusually prolonged sterile frond. This was later raised to varietal rank as *O. vulgatum*, var. *pseudopodum* (Blake) Farwell in Rep. Mich. Acad. Sci. xviii. 84 (1916). As the earliest varietal name var. *pseudopodum* seems to be the proper one for the commonest American variety.

Returning to var. *pycnostichum* (pl. 570), in outline of sterile frond and in its persistent basal sheath it strongly suggests typical Eurasian *O. vulgatum;* but it is quickly distinguished by its firm, dark-green and lustrous fronds and especially by the crowded and transversely oblong sporangia (figs. 1 and 7–9). In the latter characters it stands far apart from the others.

My interpretation of the North American varieties of *Ophioglossum vulgatum* may be summarized as follows.

[O. vulgatum L. Sp. Pl. ii. 1062 (1753). Common stalk surrounded at base by a brownish chartaceous or coriaceous sheath; sterile frond usually ovate or oval, with rounded base, yellowish-green, opaque; sporangia suborbicular or round in outline.—Eurasia. Plate 571.]

Var. alaskanum (E. G. Britton) C. Chr. in Hultén, Kungl. Sv. Vet. Akad. Handl. v. no. 1 (Fl. Kamtch.), 45 (1927). *O. alaskanum* E. G. Britton in Bull. Torr. Bot. Cl. xxiv. 556, t. 319, fig. 5 (1897). Sterile frond thin, translucent, ovate, rounded at base, the venation very evident, recalling that of *O. reticulatum;* sporangia round.—Alaska and Kamtchatka.

Var. pycnostichum Fernald, supra. Common stalk surrounded at base by a brownish firm sheath; sterile frond round- to narrow-ovate or broadly lanceolate, mostly rounded at base, dark-green, firm, lustrous; sporangia crowded, transversely oblong.—Rich, chiefly calcareous woods, Maryland to North Carolina and southern Indiana. Fruiting from May to July. Plate 570.

Presumably some of the specimens cited by Clausen from the southern part of the range belong here.

Var. pseudopodum (Blake) Farwell in Rep. Mich. Acad. Sci. xviii. 84 (1916). Forma *pseudopodum* Blake in Rhodora xv. 87, fig. 1 (1913). *O. pusillum* Raf. in Desv. Journ. Bot. sér. 2, iv. 273 (1814). *O. Grayi* Beck, Bot. No. and Mid. U. S. 458 (1833), provisional (invalid) name. *O. arenarium* E. G. Britton in Bull. Torr. Bot. Cl. xxiv. 556, t. 318 and t. 319, fig. 3 (1897). *O. vulgatum*, forma *arenarium* (E. G. Britton)

Clute, Our Ferns in their Haunts, 47, 316 (1901). *O. vulgatum,* var. *lanceolatum* Clute in Fern Bull. xix. 72 (1911) not Luerss. (1878). *O. vulgatum,* forma *lanceolatum* (Clute) Blake in RHODORA, XV. 87 (1913). *O. vulgatum,* forma *pusillum* (Raf.) House in Bull. N. Y. State Mus. cclxiii-cclxiv. 42 (1923).—Peaty or grassy swales, wet thickets and shores, damp sands, sterile pastures, etc., Quebec to Washington, south at least to Delaware, Pennsylvania, Ohio, Indiana, Illinois, Nebraska, Arizona and Mexico (the latter with the undescribed synonym *O. Pringlei* Underwood ex Clausen, l. c. 125 (1938) in synonymy). Fruiting from late May to August. PLATE 572.

The smaller plants have been erroneously referred to var. *minus* Moore of Europe.

EXPLANATION OF PLATES 570–572

PLATE 570. OPHIOGLOSSUM VULGATUM L., VAR. PYCNOSTICHUM Fernald: FIG. 1, TYPE, × 1, from east of Burgess Station, Virginia, *Fernald & Long,* no. 9796; FIG. 2, plant, × 1, from Capitol Landing, Virginia, *Grimes,* no. 3444; FIG. 3, basal sheath, × 1, from the TYPE; FIG. 4, basal sheath, × 5, from *Grimes,* no. 3444; FIG. 5, basal sheath, × 5, from Marshall Township, Indiana, *Kriebel,* no. 176; FIG. 6, basal sheath, × 5, from Dupont Heights, District of Columbia, July 22, 1905, *Tidestrom;* FIG. 7, fruiting spike, × 3, from the TYPE; FIG. 8, mature sporangia, × 10, from *Kriebel,* no. 176; FIG. 9, immature sporangia, × 10, from *Tidestrom;* FIG. 10, venation of sterile segment, × 5, from Disputanta, Virginia, *Fernald & Long,* no. 7744.

PLATE 571. OPHIOGLOSSUM VULGATUM, (typical): FIG. 1 (including base at extreme left), portions of plant, × 1, from near Vienna, Austria, June 12, 1895, *Dörfler;* FIG. 2, plant, × 1, from Grönskär, Södermanland, Sweden, July 17, 1927, *Asplund;* FIG. 3, plant, × 1, from Scandinavia, June 27, 1882, *Tharsson;* FIG. 4, basal sheath, × 5, from Vienna specimen, *Dörfler;* FIG. 5, basal sheath, × 5, from Scandinavian plant, *Tharsson;* FIG. 6, basal sheath, × 1, from Vienna plant, *Dörfler;* FIG. 7, basal sheath, × 5, from Todahara, Mushashi, Japan, May 24, 1891, *Watanabe;* FIG. 8, sporangia, × 10, from Vienna plant, *Dörfler;* FIG. 9, sporangia, × 10, from Swedish plant, *Asplund;* FIG. 10, venation of sterile segment, × 5, from same plant as FIG. 1.

PLATE 572. OPHIOGLOSSUM VULGATUM, VAR. PSEUDOPODUM (Blake) Farwell: FIG. 1, plant, × 1, from Dixville Notch, New Hampshire, July 27, 1906, *E. F. Williams;* FIG. 2, plant, × 1, from Cedar Lake, Nova Scotia, *Fernald, Bean & White,* no. 19,483; FIG. 3, ISOTYPE, × 1, of *O. vulgatum,* forma *pseudopodum* Blake; FIG. 4, base of common stalk, × 5, from Nova Scotia, no. 19,483; FIG. 5, base of common stalk, × 5, from Dixville Notch, New Hampshire, *Williams;* FIG. 6, base of common stalk, × 1, from Willoughby, Vermont, July 21, 1896, *Kennedy;* FIG. 7, base of common stalk, × 5, from same collection as fig. 6; FIG. 8, sporangia, × 10, from the Nova Scotian plant, no. 19,483; FIG. 9, sporangia, × 10, from the Willoughby plant; FIG. 10, sporangia, × 10, from ISOTYPE of *O. vulgatum,* forma *pseudopodum* Blake.

PINUS PALUSTRIS Mill. Local. NANSEMOND COUNTY: white sand of pine barrens southwest of South Quay, no. 10,084; also seen in white sand, south of Cleopus. ISLE OF WIGHT COUNTY: open white sand in dry pine barrens, south of Zuni, *Fernald, Long & Correll,* no. 9676. SOUTHAMPTON COUNTY: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, no. 9798.

At the Zuni station and below South Quay numerous old and fruiting trees as well as seedlings; at the other stations mostly young trees. See p. 488.

Chamaecyparis thyoides (L.) BSP. Southampton County: several large trees in wooded swamp about 7 miles south of Franklin, no. 8535. See p. 469. Nansemond County: many large fruiting trees and seedlings in wet wooded depression in pine barrens east of Cherry Grove, south of South Quay, no. 10,475.

Certainly highly localized in Virginia; perhaps not elsewhere known outside the Great Dismal Swamp. See pp. 469 and 488.

*Najas gracillima (A. Br.) Magnus. Caroline County: peaty pond-hole southeast of Milford, no. 8914. See p. 474.

Extension southward.

Potamogeton capillaceus Poir. To the single reported station in Nansemond County add the following. Isle of Wight County: rills, sandy and peaty border of Cat Pond, south of Benns Church, no. 8019. Southampton County: floating at border of Predler's Pond, Nottoway Swamp, southwest of Sedley, no. 8018; border of peaty pool in cypress-gum swamp, about 4 miles northeast of Capron, no. 7196. Greensville County: pool in *Cephalanthus* swamp, about 1 mile north of Skipper's, no. 8537.

Eragrostis hypnoides (Lam.) BSP. To the few stations add one in Chesterfield County: margin of exsiccated old mill-pond in Swift Creek, Lakeview, no. 9272. See p. 477.

*E. poaeoides Beauv. Caroline County: railroad gravel southeast of Guinea, no. 8959. Dinwiddie County: cinders in freight-yard of Norfolk and Western Railroad, Petersburg, no. 10,523. See p. 474.

No Virginian station indicated in Hitchcock's *Manual*.

*E. hirsuta (Michx.) Nees, var. **laevivaginata**, var. nov., vaginis glabris.—Maryland to Florida. Type from wooded alluvial bottomland of Meherrin River, near Haley's Bridge, Southampton County, Virginia, *Fernald & Long*, no. 9273 (type in Herb. Gray; isotype in Herb. Phil. Acad.).

Typical *Eragrostis hirsuta*, based on *Poa hirsuta* Michx., has strongly hirsute sheaths. It was described from South Carolina and is represented in the Gray Herbarium only thence to Florida and westward to Louisiana and Oklahoma, with the exception of Blake's no. 11,675 from a road-working in Arlington County, Virginia. All other material before me from Maryland, Virginia (Northampton, Princess Anne, Nansemond, Greensville, Southampton and Prince George Counties) and North Carolina and much from Georgia and northern Florida (for example, *Nash*, no. 2521, from Tallahassee) has

all or all but the very lowest sheaths quite glabrous except for the marginal and apical ciliation. This is so striking a departure from the generally more southern and western hirsute-sheathed plant that it is clarifying to have a designation for it. By the key in Hitchcock's Manual the student would be unable to identify the relatively common *E. hirsuta*, var. *lacvivaginata*, for in Hitchcock's key the only provision for the inclusive species (p. 141) is under "Sheaths pilose or hirsute," although the description of *E. hirsuta* (p. 158) allows "sheaths hirsute to glabrous."

*Festuca octoflora Walt., var. tenella (Willd.) Fern. in Rhodora, xxxiv. 209 (1932). Sussex County: fallow sandy fields and roadsides 4 miles northwest of Homeville, no. 9835.

Our only collection of the small and mostly northern var. *tenella*. Typical southern *F. octoflora* is common.

Melica mutica Walt. occurs as two forms on the Coastal Plain of Virginia. Typical M. mutica (*M. glabra* Michx.; *M. mutica*, var. *glabra* (Michx.) Gray), the plant with glabrous or merely scabrous sheaths, we have from the following stations. Elizabeth City County: Hampton, May 1, 1894, *J. R. Churchill*. Princess Anne County: rich woods, Cedar Island, *Fernald, Griscom & Long*, no. 4560. Surry County: rich calcareous wooded slopes along James River, Claremont Wharf, no. 9828 (1 m. high). Dinwiddie County: borders of dry oak and pine woods north of Burgess Station, no 9827.

M. mutica Walt., forma **diffusa** (Pursh), comb. nov. *M. diffusa* Pursh, Fl. Am. Sept. i. 77 (1814). Var. *diffusa* (Pursh) Gray, Man. ed. 5: 626 (1867). With copiously pilose sheaths and, often, blades. Nansemond County: wooded slope, Kilby, no. 6484. Surry County: rich wooded slope at head of Sunken Meadow Creek, south of Claremont, no. 7755. Dinwiddie County: borders of dry oak and pine woods north of Burgess Station, no. 9829.

Very striking in its extreme, with gray-pilose sheaths and blades, forma *diffusa* occurs through much, if not all of the range of typical glabrous- or merely scabrous-sheathed *M. mutica*. It is therefore best treated as a form.

*Calamovilfa brevipilis (Torr.) Scribn., var. **calvipes**, var. nov. (tab. 573, fig. 1 et 2), foliis scabris; paniculis valde exsertis laxe ovoideis 1.3–2 dm. longis 0.7–1 dm. diametro, ramis patentibus vel laxe subadscendentibus; pedicellorum apicibus nudis; spiculis 4–5 mm. longis; lemmatibus paleisque subaequalibus valde strigosis.—Virginia: sphagnous bog about 1 mile northwest of Dahlia, Greensville County, July 15, 1938, *Fernald & Long*, no. 8548 (type in Herb. Gray; isotype in Herb. Phil. Acad.). In plate 573, the habit, × 2/5 is shown in fig. 1; a spikelet, × 10, in fig. 2. See p. 472 and map 9.

Typical *Calamovilfa brevipilis* of the Pine Barrens of New Jersey, has less scabrous leaves; panicles often (though not always) with included or barely exserted bases, and slender (lanceolate to lance-ovoid), 1.5–3 dm. long and 4–10 (–14) cm. in diameter, the branches usually strongly ascending, though in age sometimes loosely spreading. Its pedicels (FIG. 3) are terminated by a tuft of stiffish hairs resembling those of the callus; the spikelets are 4.5–5.5 mm. long, with essentially equal lemma and palea (FIG. 3), these less pubescent than in the Virginian plant.

In southeastern North Carolina *Calamovilfa brevipilis* has a third variety. Its long-exserted lanceolate panicle resembles that of var. *typica*[1] of southern New Jersey; but the beard at the tips of the pedicels is much reduced, the spikelets (FIG. 4) are 5.5–6 mm. long and the lemmas and paleas are conspicuously unequal. This southernmost extreme of the species may be called

C. BREVIPILIS (Torr.) Scribn., var. **heterolepis**, var. nov. (TAB. 573, FIG. 4), var. *typicae* simillima; paniculis lanceolatis 2.1 dm. longis 5 cm. diametro, ramis valde adscendentibus; pedicellorum apicibus breviter pilosis; spiculis 5.5–6 mm. longis; lemmatibus paleisque valde inaequalibus.—NORTH CAROLINA: edge of swamp, between Coats and Erwin, Harnett County, "rare!", July 15, 1935, *Correll & Blomquist*, no. 2539 (TYPE in Herb. Gray).

Calamovilfa brevipilis must be a very ancient type. Its three known areas are on the Coastal Plain or at its inner margin and separated by distances of 125 and of 225 miles. Only var. *typica*, of the Pine Barrens of New Jersey, has an extended area, Stone saying of it: "Common in Pine Barren bogs. . . . This is one of the characteristic grasses of the Pine Barrens." Var. *heterolepis*, as quoted from the label is "rare!"; and, surely, the Virginian var. *calvipes* is one of the rarest plants of the state. Our station is a colony of not more than a square rod in the most perfect sphagnous bog of Greensville County, there associated with such excessively local plants as *Ctenium aromaticum*, *Paspalum praecox*, var. *Curtisianum* (*P. lentiferum*), *Lachnocaulon anceps*, *Xyris flexuosa*, *platylepis* and *Curtissii*, *Zigadenus angustifolius*, *Burmannia biflora*, *Oxypolis ternata*, *Utricularia juncea* and *virgatula*, and *Carphephorus tomentosus*.

*AGROSTIS ELLIOTTIANA Schultes. GREENSVILLE COUNTY: fallow

[1] CALAMOVILFA BREVIPILIS (Torr.) Scribn., var. **typica.** *Arundo brevipilis* Torr. Fl. No. Mid. U. S. i. 95 (1823). *C. brevipilis* (Torr.) Scribn. in Hackel, True Grasses, 113 (1890).

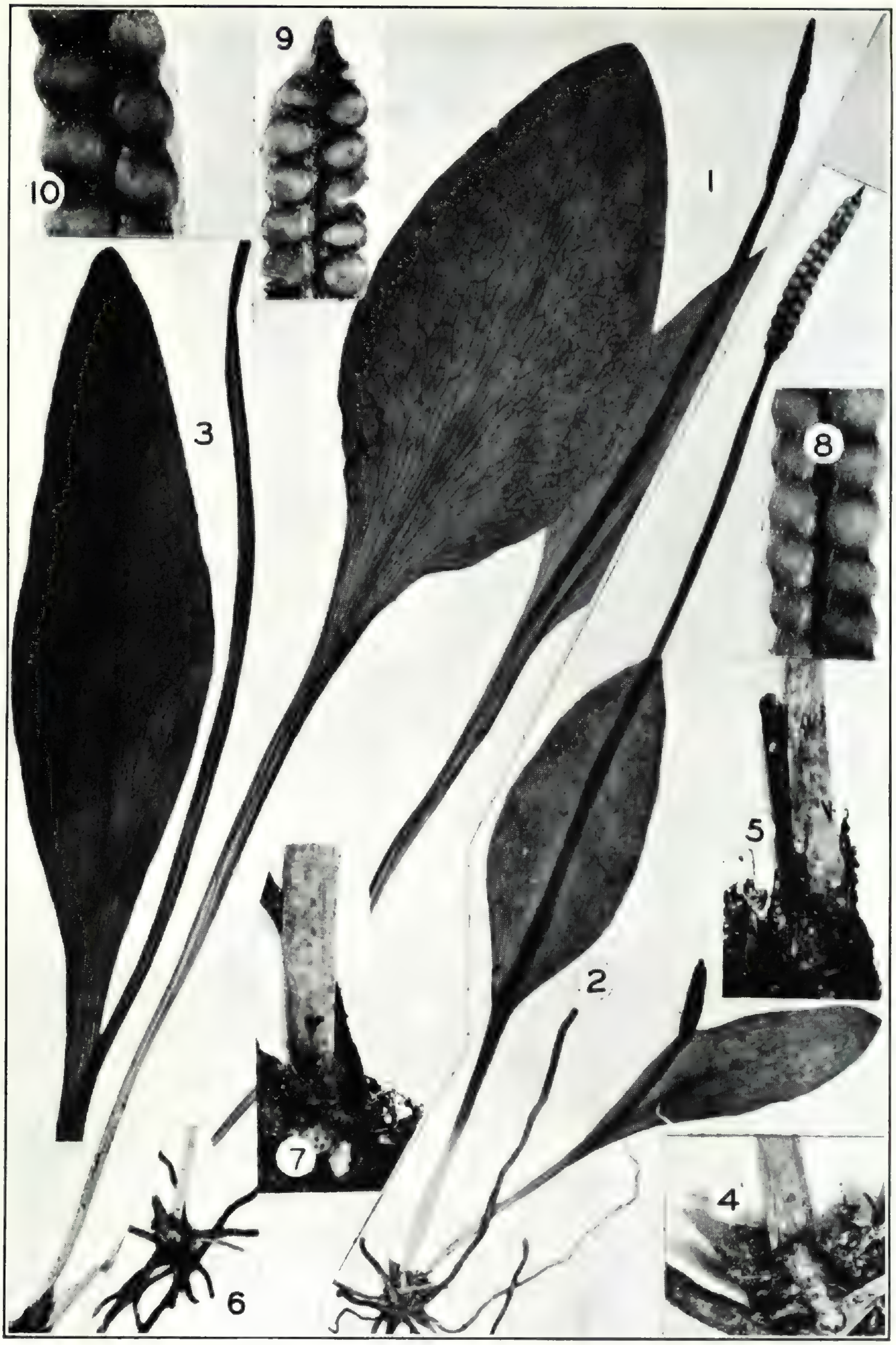


Photo. W. H. Hodge

OPHIOGLOSSUM VULGATUM, var. PSEUDOPODUM: FIG. 1, plant, × 1, from New Hampshire; FIG. 2, small plant, × 1, from Nova Scotia; FIG. 3, portion of ISOTYPE of *O. vulgatum*, forma *pseudopodum;* FIG. 4, base of common stalk, × 5, from Nova Scotia; FIG. 5, base of common stalk, × 5, from New Hampshire; FIG. 6, base of common stalk, × 1, from Vermont; FIG. 7, base of common stalk, × 5, from Vermont; FIG. 8, sporangia, × 10, from Nova Scotia; FIG. 9, sporangia, × 10, from Vermont; FIG. 10, sporangia, × 10, from ISOTYPE.

Photo. W. H. Hodge

CALAMOVILFA BREVIPILIS: FIG. 3, spikelet, × 10.
Var. CALVIPES: FIG. 1, habit, × 2/5; FIG. 2, spikelet, × 10.
Var. HETEROLEPIS: FIG. 4, spikelet, × 10.

argillaceous field and exsiccated pond-hole, north of Skipper's, no. 9816. See p. 470.

Not mapped for Virginia in Hitchcock's Manual.

AGROSTIS ELATA (Pursh) Trin. The vegetative character pointed out in RHODORA, xxxix. 363 (1937) holds throughout the region. Characteristic of sphagnous bogs and wet pinelands, especially well developed in Greensville, Sussex and Dinwiddie Counties; there with very large panicles (up to 3.5 dm. long).

ARISTIDA LANOSA Muhl. SOUTHAMPTON COUNTY: dry white sand in woods, Terrapin Ridge, east of Drewryville, no. 8955.

Extension inland, 75 miles, from the coast of Princess Anne.

LEPTOCHLOA FILIFORMIS (Lam.) Beauv. To the few known Virginian stations add one in GREENSVILLE COUNTY: weed in cotton-field near Hitchcock Quarry, no. 9536.

SPARTINA ALTERNIFLORA Loisel., var. GLABRA (Muhl.) Fern. Extending inland at least to ISLE OF WIGHT COUNTY: brackish marsh along Cypress Creek, Smithfield, no. 8957.

CTENIUM AROMATICUM (Walt.) Hitchc. To the scattered Virginian stations recorded add one in GREENSVILLE COUNTY: sphagnous bog 1 mile northwest of Dahlia, no. 8550. See p. 472.

LEPTOLOMA COGNATUM (Schultes) Chase. Frequent from Dinwiddie and Prince George Counties southward.

Usually flowering in late summer and autumn; found in good flower in Southampton County on June 20.

AXONOPUS FURCATUS (Flügge) Hitchc. Northward to YORK COUNTY: swale southeast of Tabb's, no. 8553.

Not seen by Grimes.

PASPALUM DISSECTUM L. To the few stations in Southampton County add an extensive one in CHESTERFIELD COUNTY: margin of exsiccated old mill-pond in Swift Creek, Lakeview, no. 9254. See p. 477.

P. FLUITANS (Ell.) Kunth. See Fernald in RHODORA, xxxix. 282, tab. 474, figs. 6–13 (1937). To the stations in Southampton County add an extensive one in CHESTERFIELD COUNTY: margin of exsiccated old mill-pond in Swift Creek, Lakeview, no. 9253. See p. 477.

Both *P. fluitans* and *P. dissectum* abound at this station. They are strongly contrasted in the mat of vegetation by the blue-green color of the latter, the warmer green of the former.

P. SETACEUM Michx., var. SUPINUM (Bosc) Trin. (*P. supinum* Bosc.). To stations in Northampton and Princess Anne Counties add the following. NANSEMOND COUNTY: woods about 2 miles southeast of Cleopus, no. 8928.

*P. URVILLEI Steud. WARWICK COUNTY: dry railroad bank, Naval Mine Depot, north of Lee Hall, no. 8556. NANSEMOND COUNTY: rail-

road bank near lumber camp of Camp Lumber Co., Great Dismal Swamp, southeast of Whitemarsh School, no. 10,490.

A strikingly distinct species, evidently adventive along the Naval railway. Itself well armored with promptly deciduous fine stinging bristles on the lower sheaths! See p. 469.

P. PRAECOX Walt., var. CURTISIANUM (Steud.) Vasey (*P. lentiferum* Lam.). To the single known Virginian station (in Sussex County) add one in GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, no. 9255. See p. 485.

*PANICUM FUSIFORME Hitchc. DINWIDDIE COUNTY: dry clearings and borders of woods south of Burgess Station, no. 8560.

Extension north from Georgia. See p. 469.

P. NITIDUM Lam. To the few Virginian stations add one in GREENSVILLE COUNTY: wet cut-over pine and oak woods near Three Creek, north of Emporia, no. 8561.

P. MATTAMUSKEETENSE Ashe, var. CLUTEI (Nash) Fernald in RHODORA, XXXIX. 386 (1937). Range extended inland to GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, no. 8562.

P. CAERULESCENS Hack. To the single station in Princess Anne County cited by Hitchcock & Chase add one in SUSSEX COUNTY: moist (in midsummer exsiccated) argillaceous pineland about 2 miles east of Stony Creek, nos. 8940, 9525 and 10,500. PRINCESS ANNE COUNTY: inner border of brackish to fresh marsh along Back Bay, at eastern margin of Long Island, no. 10,501.

Certainly a very rare species in Virginia. See p. 476.

P. ALBOMARGINATUM Nash. Inland to GREENSVILLE and SUSSEX COUNTIES.

P. TRIFOLIUM Nash. Inland to DINWIDDIE COUNTY.

P. ENSIFOLIUM Baldwin. Inland to DINWIDDIE and GREENSVILLE COUNTIES.

(*To be continued*)

DISTRIBUTION NOTES CONCERNING PLANTS OF GLACIER NATIONAL PARK, MONTANA—II

BASSETT MAGUIRE

During part of the summer of 1934, the writer, for a second time, had the opportunity to make observations on the flora of the Glacier National Park. The notes here presented are in continuation of the report made upon new or interesting records obtained in 1932 (Maguire 1934).

BOTRYCHIUM SILAIFOLIUM Presl. No. 5419,[1] common in bogs about Logging Lake. Altitude 3800 feet.

EQUISETUM SYLVATICUM L. No. 5422, common under conifer woodland, Park Creek. No. 5423, common in damp humus soil along streams in dense spruce woodland, Ole Creek.

This delicately branched horsetail is apparently quite commonly and generally distributed in the moist forests of the west slope. Altitude 4000–4500 feet.

LYCOPODIUM SELAGO L. No. 5428, deep humus under thickets about the shore of Howe Lake. No. 15374, on floating log, Lincoln Lake.

These two new localities suggest that this clubmoss is quite commonly distributed about bogs in the western drainage of the Park. Altitude 4100–4500 feet.

*EQUISETUM PRATENSE Ehrh. No. 5425, along sand bank in woodlands, inlet of Bowman Lake. Altitude 4020 feet.

*ISOETES BRAUNII Durieu. No. 5429, floating in Trout Lake.

These plants were not collected "in situ," but the large quantity found floating on the surface indicates that they are a common inhabitant of the lake. Altitude 3880 feet.

*ERIOPHORUM GRACILE Koch. No. 5467, uncommon in bogs about Howe Lake. Altitude 4100 feet.

*ERIOPHORUM VIRIDI-CARINATUM (Engelm.) Fernald. No. 5468, common in wet meadows in the vicinity of Christensen's Ranch, 8 miles north of Fish Creek Ranger Station. Altitude 3780 feet.

*SCIRPUS HUDSONIANUS (Michx.) Fernald. RHODORA **8**: 161. 1906; Gray's Man. 7th Ed. 1908. Wiegand and Eames, Flora Cayuga Lake, 1926, not *Eriophorum Chamissonis* C. A. Meyer. No. 5470, common in wet meadows in the vicinity of Christensen's Ranch, 8 miles north of Fish Creek Ranger Station. Altitude 3780 feet.

It is possible that this collection represents the *Eriophorum Chamissonis* of the Flora of Glacier Park (Standley 1921).

*SCIRPUS SUBTERMINALIS Torr. No. 5563, infrequent, Lake McDonald. Altitude 3144 feet. Only sterile material seen.

JUNCUS FILIFORMIS L. No. 5549, wet meadows, vicinity of Christensen's Ranch. No. 5550, marshes along shore of Logging Lake.

These two additional stations suggest a fairly general distribution for this species of *Juncus*. Altitude 3780–3800 feet.

*ALLIUM FIBRILLUM M. E. Jones. *A. collinum* Dougl., not Guss. No. 15399, frequent in open parks, Upper Park Creek. Altitude 4500 feet.

[1] These numerals represent the writer's collection numbers.

* The asterisk designates plants which seem not to have previously been reported from Glacier National Park.

Habenaria obtusata (Pursh) Richards. No. 5573, about inlet of Bowman Lake. No. 15411, frequent in deep, wet spruce woodland near inlet of Bowman Lake.

Reported by Standley (op. cit.) only from the vicinity of Lake McDermott on the east side of the park. Altitude 4020 feet.

*Polygonum Watsonii Small. No. 15463, sandy soil under second growth *Pinus Murrayana*, vicinity of Marias Pass. Altitude 5200 feet.

*Philadelphus Lewisii Pursh. No. 15529, very conspicuous on cliffs and rocky slopes along lower Ole Creek. Observed but not collected on slopes seen from the roadside, vicinity of St. Mary's Hotel. Altitude 4000–4500 feet.

Potentilla argentea L. No. 15822, common in dry gravelly places, Fish Creek Ranger Station. Altitude 3150 feet.

*Rubus arcticus L. No. 15824, common in wet mountain meadow, vicinity of Christensen's Ranch, 8 miles north of Fish Creek Ranger Station. Altitude 3800 feet.

Callitriche palustris L. No. 901, abundant on mud and in shallow water about pond near outlet of lower St. Mary Lake. No. 902, common in marshes south of John's Lake. No. 5600, below reservoir, ½ mile west of Summit R. R. Station, Marias Pass. Altitude 3150–5200 feet.

Callitriche hermaphroditica L. No. 903, abundant in 18 inches of water about inlet of St. Mary Lake. No. 904, in shallow pool along beach of Lake Josephine. No. 906, along mud bank, Swift Current Creek, below Swift Current Lake. No. 5601, in two feet of water, Rogers Lake. Altitude 3780–4860 feet.

*Hypericum perforatum L. No. 15865, along Bear Creek.

Possibly this weedy plant is of recent introduction to the park.

Linanthus Harknessii (Curran) Greene. No. 15622, common, open places in woodland, along trail to Ptarmigan Pass, 2 miles from Mary Glacier's Hotel. Altitude, 4600 feet.

*Galium tinctorium L., var. subbiflorum (Wieg.) Fern. No. 15605, marsh about pond, Ole Creek; common in wet mountain meadows, vicinity of Christensen's Ranch, 8 miles north of Fish Creek Ranger Station. Altitude 3780–5000 feet.

*Antennaria aprica Greene. No. 15759, slopes, Ole Creek. Altitude 4500 feet. No. 15758, open places, slopes, Ole Creek. Altitude 5000 feet. No. 15757, meadows about Lake Katherine, Ole Creek. Altitude 5500 feet.

*Antennaria fusca E. Nels. No. 15760, open slopes in Spruce-lodgepole woodlands, Ole Creek. Altitude 5500 feet. No. 15761, slopes, Ole Creek 15 miles above mouth. Altitude 5500 feet. No. 15762, along Ole Creek.

These two species of *Antennaria* occurred frequently and in exten-

sively developed colonies on slopes in open woodlands and meadows along upper Ole Creek. It seems improbable that this one drainage should represent the entire distribution within the park.

In the earlier report, the writer (1934) made comment upon a number of species of *Arnica* collected in the park. Since that time he has carried on more detailed studies in the genus, the results of which make desirable corrections and further elaboration of the former notes.

*Arnica Rydbergii Greene. No. 1088, meadows at Cracker Lake. Altitude 6250 feet. No. 1089, above timber line, Piegan Pass. Altitude 7500 feet.

These records confirm the writer's former tentative determination. In addition, the writer has seen 5 collections of *P. C. Standley* (Nos. 16404, 16712, 17243, 15793, 15769, deposited in the U. S. National Herbarium), all of which are *A. Rydbergii*. It seems that these constitute primarily the basis for the inclusion of *A. alpina* (L.) Olin in Standley's "flora" (op. cit.).

The writer, in the same brief notes mentioned above, erroneously reported *A. diversifolia* from Glacier Park. It seems that this species has not been collected within the park boundaries.

Further, reference was made to certain plants which the writer had collected as "an exceedingly interesting form of the *Diversifolia* group which is not placeable in the above (*A. diversifolia*) species." Subsequently these plants formed the basis for specific distinction by Professor Nelson (1934) as *A. trina*[2] A. Nels. Subsequent examination of a much larger series of plants from Glacier Park demonstrated this form to be merely a large and few-headed phase, with 4–6 pairs of cauline leaves, of the polymorphic *A. amplexifolia* Rydb. (*A. amplexicaulis* Nutt., not Wall.). This local population predominantly occurs in the park, but intergrades there with the less frequent but more typical forms of the species. Therefore, this variant designated by Nelson as *A. trina* must become *Arnica amplexifolia* Rydb. var. **trina** (A. Nels.), comb. nov. A representative series of this variety is Maguire, Nos. 1095 (type number of *A. trina* A. Nels. deposited at the Rocky Mountain Herbarium), 1094 (cotype of *A. trina* A. Nels.), 1090, 15335, 15337, 15339, and P. C. Standley, Nos. 15601, 16668, 17286 and 18012 (deposited in the U. S. National Herbarium).

Also, in this earlier paper, the writer called attention to ". . .

[2] *Arnica trina* A. Nelson. Am. Jour. Bot. **21**: 581. 1934.

a fine, large-leaved *Arnica* probably of *Foliosae* group . . . ". Subsequently, Professor Nelson paid the writer the gracious compliment of naming these plants *Arnica Maguirei*. Subsequent collections in the park area and study of large series of specimens from various American and European herbaria reveal the plants under discussion to be a giant local variant of the complex and polymorphic assemblage which has variously gone under the name of *A. foliosa* Nutt. and those of numerous untenable segregates, and that moreover this assemblage represents a southern geographical race[1] of the earlier *A. Chamissonis* Less.[2] Therefore this large-leaved, tall (6–9 dm. high) variant becomes *Arnica Chamissonis* subsp. *foliosa* (Nutt.) Maguire, var. **Maguirei** (A. Nels.), comb. nov. The typical form of the ssp. *foliosa* occurs frequently in the area, as do many intergrades to the var. *Maguirei*. Collections which represent this extreme variant are the writers Nos. 1098 (the type collection of *A. Maguirei*) and 15356, a topotype.

Unless otherwise designated, all collections mentioned in this paper are represented in the Herbarium of the Utah State Agricultural College.

Literature Cited

Maguire, Bassett. Distribution Notes Concerning Certain Plants of Glacier National Park. Rhodora **36**: 305. 1934.
Nelson, Aven. Rocky Mountain Herbarium Studies II. Am. Jour. Bot. **21**: 581. 1934.
Standley, P. C. Flora of Glacier National Park, Montana. Contr. U. S. Nat. Herb. **22**: Pt. 5. 1921.

Logan, Utah

LIST OF SECOND HUNDRED FUNGI OF NANTUCKET[3]

E. F. Guba

The island of Nantucket, Massachusetts, presents a fertile field of effort to one interested in its mycologic flora. Its ferns and flowering plants have been thoroughly worked by Bicknell[4] whose contributions

[1] *Arnica Chamissonis* Less. subsp. **foliosa** (Nutt.) Maguire, comb. nov. *Arnica foliosa* Nutt. Trans. Am. Phil. Soc. **11**. 7: 408. 1841.

[2] *Arnica Chamissonis* Lessing. Linnaea **6**: 238. 1831.

[3] Contribution Vol. IV No. 1 of the Nantucket Maria Mitchell Association, Div. of Natural Science, Nantucket, Mass. For the List of the First Hundred see Rhodora **39**: 367–376, 1937. The cost of illustration is met by the author and by the Maria Mitchell Association.

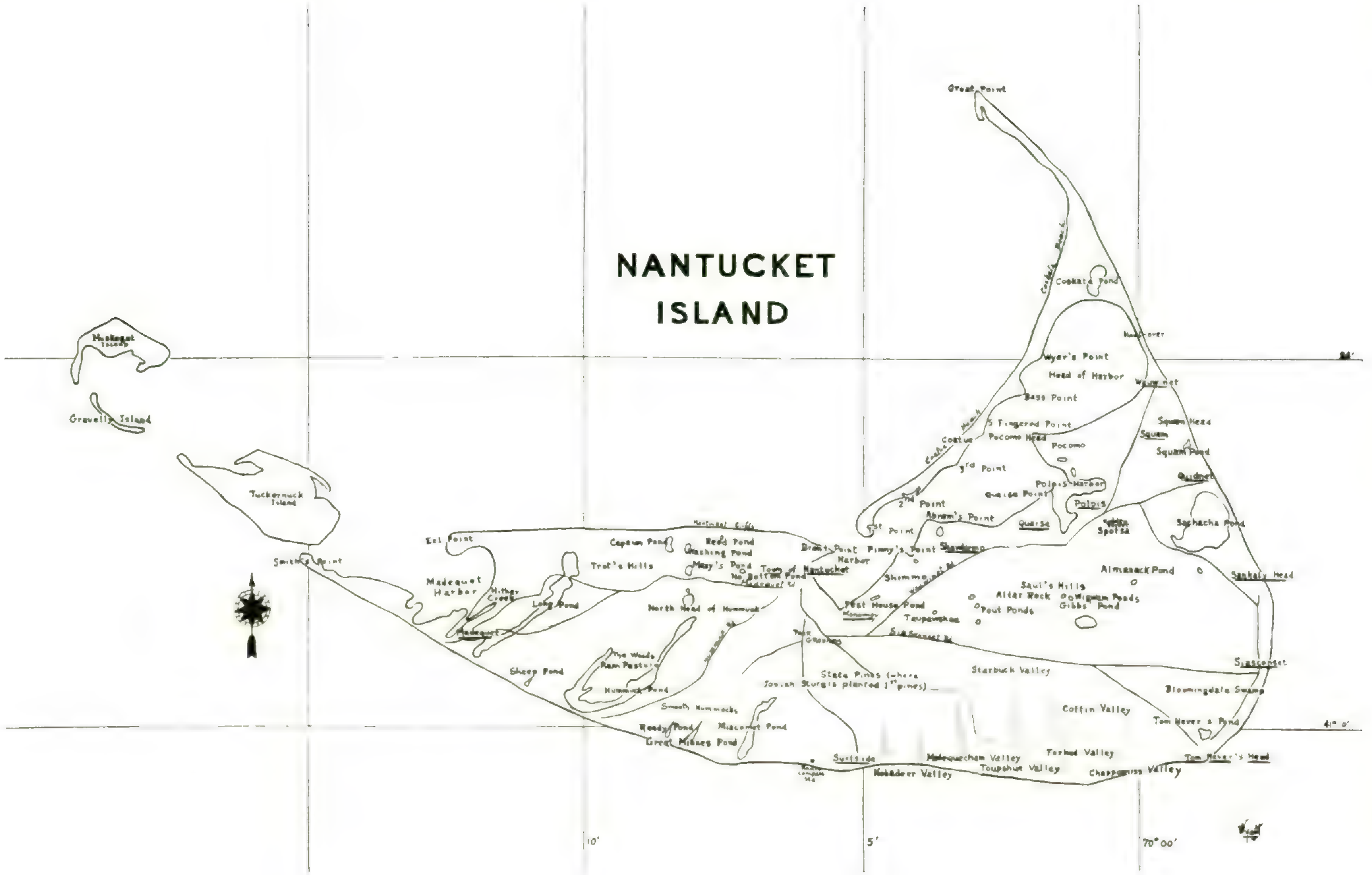
[4] For bibliography, see first list of Nantucket Fungi.

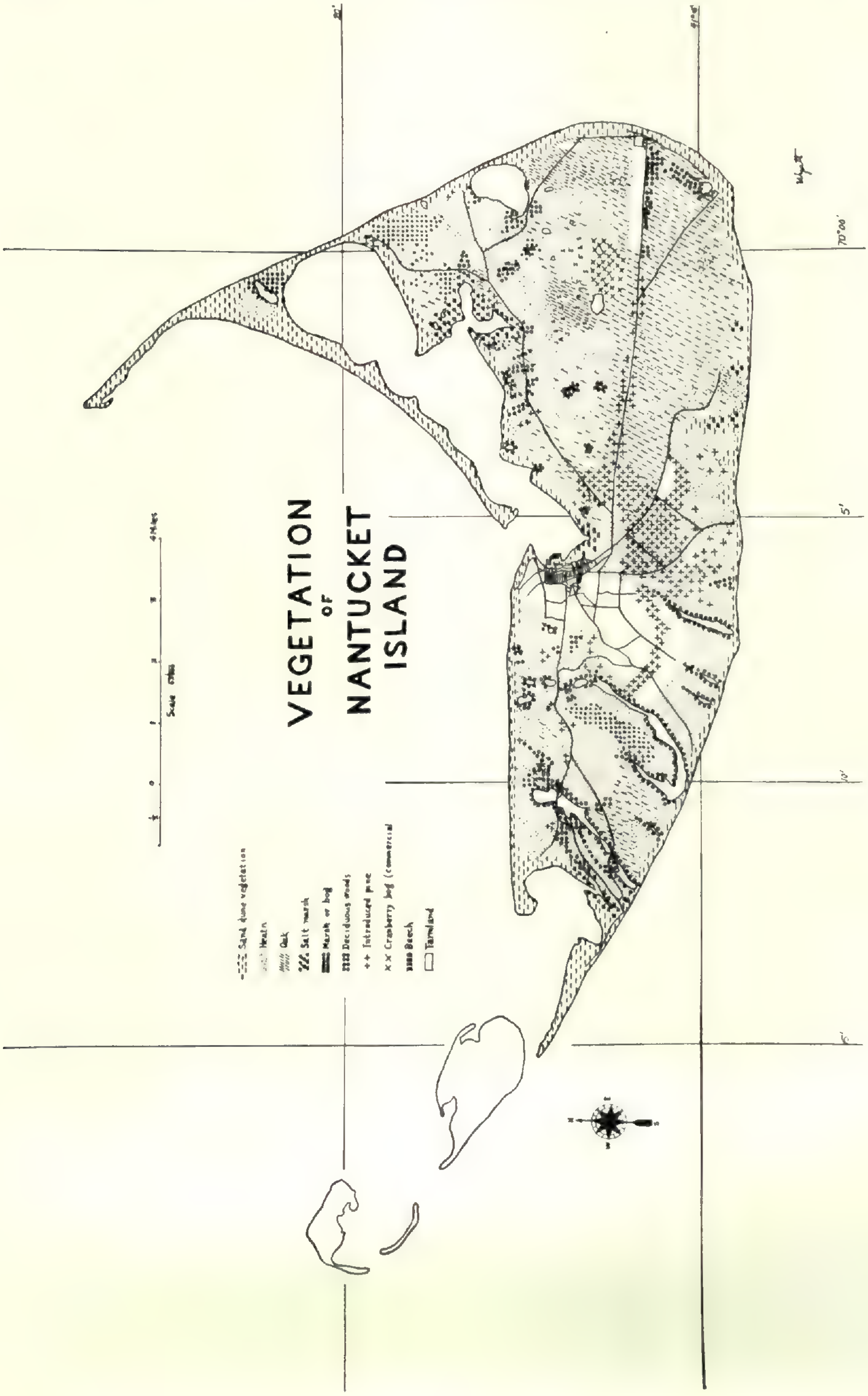
on the subject are of inestimable value in the identification of the plant parasitic fungi. This small remote island with circumscribed limits presents the opportunity and the satisfaction of obtaining a completeness of representation of its flora that is not easily possible for areas on the mainland. The arrangement of the vegetation on Nantucket, in rather definite limited masses determined by localized factors of soil, elevation, water, etc., as heath, bog, deciduous forest, sand dune, salt marsh vegetation and other types, offers a striking and appealing diversification to the collector and enables a complete representation especially of the most evident fungi, without much travel.

The charm of Nantucket and its fascinating ecological and climatic features have indirectly and lately served to attract others to an interest in its mycologic flora. It is hoped that these contributions, infrequent as they must necessarily be, will serve as a foundation for others to enlarge upon this effort and encourage other scientific pursuits on Nantucket. I am grateful to Mr. E. V. Seeler, Jr., a frequent visitor to Nantucket, for his generous contributions to this second list and to Dr. D. H. Linder of Harvard University for aid rendered him in making the determinations of some of his collections and for the preparation of the Latin descriptions of three new species reported in this paper; to Mr. C. J. Gilgut of the Massachusetts State College for the identification of some of the collections; finally to Mr. James P. Kimball, resident of the island, for certain collections of fleshy fungi. All of the other collections and identifications are by the writer whose visits to the island from time to time have been restricted to vacation periods.

A factor encouraging the pursuit of scientific effort in any region is the stimulating enthusiasm offered by the inhabitants. The people of Nantucket from the earliest times have fostered an interest in the natural sciences peculiar to the island. The study of its flora has been given considerable attention. In recent years this work has been energetically promoted by Miss Grace Wyatt, Director of Natural Science of the Nantucket Maria Mitchell Association. I am gratefully indebted to her for the fine maps of Nantucket showing the vegetation, ponds, hills, contours, etc., which are presented here to render more complete the reader's concept of the flora of the island. The original vegetation map of Nantucket by Harshberger published in 1914 has served as a guide in the preparation of the latest maps.

NANTUCKET ISLAND




VEGETATION
OF
NANTUCKET
ISLAND
Scale miles
Sand dune vegetation
Heath
Oak
Salt marsh
Marsh or bog
Deciduous woods
Introduced pine
Cranberry bog (commercial
Beach
Farmland
70°00'
5'
10'

An idea of the changes in the mass vegetation of the island since 1914 may be acquired from a study of these maps.

List of Second Hundred Fungi of Nantucket

101. Alternaria Brassicae (B.) Sacc. On living leaves of *Brassica Rapa* L. Farm land at southern end of Hummock Road. Aug. 17, 1936. Very common especially on the lower leaves.
102. Alternaria Solani (Ell. & Martin) Jones & Grout. On living leaves of cultivated *Solanum tuberosum* L. Nursery and market garden outside of town on the Madaket Rd. Aug. 15, 1936. Very common. Familiar in plant pathological literature as "early blight."
103. Alternaria Solani (Ell. & Martin) Jones & Grout. On living leaves of *Lycopersicum esculentum* Mill. Same location as No. 102. Very common.
104. Amanita rubescens Pers. Very abundant on ground in mat of pine needles, State White Pines south of Fair Grounds. Aug. 7, 1938. Coll. & det. by *E. V. Seeler, Jr.*
105. Apiosporina Collinsii (Schw.) V. Höhnel. On leaves of *Amelanchier canadensis* (L.) Medic. Beach Rd. to Quidnet near Wauwinet, June 25, 1938. Coll. and det. by *E. V. Seeler, Jr.*

This fungus causes a widespread witches broom characterized by numerous branches in which the mycelium of the parasite is perennial and by the development of a rich olivaceous or sooty mold of Cladosporium on the lower leaf surfaces. The perithecial stage develops in late summer in the sooty mold. Injury to the host is slight.

106. Ascochyta graminicola Sacc. On leaves of *Agropyron repens* (L.) Beauv. In fields along the Madaket Rd. Aug. 16, 1936.
107. Ascochyta Lophanthi J. J. Davis var. lycopina J. J. Davis. On living leaves of *Lycopus uniflorus* Michx. On the border of Capaum Pond. Oct. 1, 1936.
108. Boletus castaneus Bull. On lawn in shade of *Quercus alba* L., 20 Orange Street. Coll. by *E. V. Seeler, Jr.* July 28, 1938. Det. by D. H. Linder.
109. Boletus edulis (Bull.) Fr. Sept. 18, 1937. Coll. by *Chas. P. Kimball.* Det. by C. J. Gilgut.
110. Boletus felleus (Bull.) Fr. Sept. 18, 1937. Coll. by *Chas. P. Kimball* in pine woods east of his residence. Det. by C. J. Gilgut. Also collected and identified by *E. V. Seeler, Jr.*, State Pines south of Fair Grounds, Aug. 7, 1938.
111. Boletinus pictus Pk. On ground in mat of needles of *Pinus Strobus* L. State Pines south of Fair Grounds. Aug. 7, 1938. Coll. by *E. V. Seeler, Jr.* Det. by D. H. Linder.
112. Camarosporium metableticum Trail. On brown weathered

foliage of *Ammophila breviligulata* Fern. End of hard road at Madaket. Oct. 1, 1936. Common.

113. Cercospora Lathyri Dearn. & House. On living leaves of *Lathyrus maritimus* Bigel. Along the Haulover to Coskata. Aug. 15, 1936. Common, appearing in round to elliptical pale spots with distinct purple margins.

114. Cercospora rhoina C. & E. On leaves of *Rhus copallina* L. On eastern area of the Island. Sept. 30, 1936. Very noticeable toward latter part of season by distinct brown to purple spotting of the leaflets.

115. Cladosporium **Lysimachiae** Guba sp. nov., conidiophoris amphigenis plerumque epiphyllis, primo in maculis parvis rotundatisque aggregatis deinde in pagina inferiore per vena foliorum crebrescentibus, fuscis, septatis, simplicibus vel non-numquam sinuosis vel geniculatis, 3.8–5 μ diametro, 63–110 μ longitudine; conidiis uniseptatis, pallide virescentibus, oblongo-ellipsoideis, 12–19 x 5.3–6.3 μ, non vel leviter ad septum con-strictis.

Conidiophores amphigenous, for the most part epiphyllous, at first collected in small circular areas on the upper surface of the leaves and then spreading out from the venation on the lower surfaces, decumbent, dark olivaceous, sparsely septate, simple, mostly somewhat geniculate and with numerous spore scars, 3.8–5 μ in diameter, 63–110 μ long. Conidia 2-celled, pale greenish under the microscope, pecan-shaped or elongate-ellipsoid, 12–19 x 5.3–6.3 μ, slightly or not constricted at the septum, spore walls smooth.—On living leaves, rarely on the stems of *Lysimachia vulgaris* L. In waste places near the water front east of Main St., Aug. 15, 1936. Both upper and lower surfaces of the leaves are richly blotched with the dark olive wefts of the fungus.

116. Clavaria amethystina (Batt.) Bull. Sept. 18, 1937. Coll. by *Chas. P. Kimball.* Det. by C. J. Gilgut. Very common in the pine woods on the island. Other collections made in August.

117. Clavaria fusiformis Sow. Hidden Forest. Oct. 1, 1936. Coll. by *H. S. Tiffany.* Det. by C. J. Gilgut.

118. Clavaria inaequalis Mull. In Pine Woods. General on the Island. Aug. 12, 1936. Det. by C. J. Gilgut.

119. Claviceps purpurea (Fr.) Tul. On *Spartina alterniflora* Loisel. var. *pilosa* (Merr.) Fern. with *Uromyces acuminatus* Arth. III. Oct. 1, 1936. Long Pond, Madaket.

120. Clitocybe gigantea (Sow.) Quel. Sept. 18, 1937. Coll. by *Chas. P. Kimball.* Det. by C. J. Gilgut.

121. Coccophacidium cembrae Rehm. On lower dead branches of *Pinus Strobus* L. State Pines south of Fair Grounds. Coll. and Det. by *E. V. Seeler, Jr.* May 15, 1938. Fruiting bodies of circular outline and about 1 mm. in diameter, densely dotting the bark. Spores of smaller size than *C. Pini* (Fr.) Karst.

122. Coleosporium Solidaginis (Schw.) Thüm II. On living leaves of *Aster novi-belgii* L. Basset Jones Estate, Polpis. Sept. 30, 1936. Common on asters at this season.
123. Coleosporium Solidaginis (Schw.) Thüm II. On living leaves of *Aster ericoides* L. (*A. multiflorus* Ait.) In places along the Siasconset Rd. Sept. 28, 1936.
124. Craterellus cornucopioides Fr. Hidden Forest. Oct. 1, 1936. Det. by C. J. Gilgut.
125. Crucibulum vulgare Tul. On fallen twigs and leaves of *Fagus grandifolia* Ehrh., Hidden Forest, Aug. 5, 1938. Coll. & det. by *E. V. Seeler, Jr.* Fruiting bodies resting on substrata like bird's nests.
126. Cytospora ambiens Sacc. On dead or withering twigs of *Ulmus americana* L. East of Main Street near water front. Coll. by *Walter Eger*, Sept. 15, 1935.
127. Dacryomyces aurantius (Schw.) Farlow. On bark of dead branch of *Pinus rigida* Mill. State Pines south of Fair Grounds, May 15, 1938. Coll. and det. by *E. V. Seeler, Jr.*
128. Daedalia confragosa (Bolt.) Pers. On *Salix sp.* Hidden Forest, May 30, 1936. Coll. & det. by *I. H. Crowell.*
129. Daedalia confragosa (Bolt.) Pers. On large dead tree of cultivated *Prunus* (cherry). Yard at 20 Orange Street, Aug. 19, 1938. Coll. and det. by *E. V. Seeler, Jr.*
130. Darluca filum (Biv.) Cast. Occurring on uredospores of *Puccinia Menthae* Pers. on living leaves of *Pycnanthemum muticum* (Michx.) Pers. North edge of Nantucket's largest cranberry bog and approaching Saul's Hills. Coll. and det. by *E. V. Seeler, Jr.* July 31, 1938.
131. Dasycypha Ellisiana (Rehm.) Sacc. On dead branches of *Pinus Strobus* L. State Pines south of Fair Grounds. May 15, 1938. Coll. and det. by *E. V. Seeler, Jr.* Also on dead branches of *Pinus rigida* Mill. Same location, May 15, 1938. Coll. and det. by *E. V. Seeler, Jr.* and reported to be very common.
132. Didymella Iridis (Desm.) Tisdale. On dying leaves of *Iris versicolor* L. Capaum Pond, Oct. 1, 1936. Brown or orange elongate lesions coalescing and blighting the green leaves.
133. Diplodia Smilacina B. On spots on living leaves of *Smilax rotundifolia* L., associated with *Sphaeropsis Smilacis* Ell. & Everh. In thicket at Polpis, Oct. 1, 1937.
134. Discosia faginea Lib. On brown over-wintered leaves of *Fagus grandifolia* Ehrh., Hidden Forest, May 30, 1936, with No. 156, *Mycosphaerella punctiformis* (P. ex. Fr.) Schrt.
135. Ditiola radicata (Alb. & Schw.) Fr. On bark on dead branches of *Pinus rigida* Mill. State Pines south of Fair Grounds. Coll. and det. by *E. V. Seeler, Jr.*
136. Erysiphe Cichoracearum DC. On leaves and stems of *Verbena hastata* L. South of Coskata Pond. Aug. 16, 1936. Epidemic

on this host. Powdery mildew covering the foliage and richly dispersed with perithecia. The lower leaves killed off.

137. Erysiphe Cichoracearum DC. On living leaves of *Solidago altissima* L. Polpis. Sept. 29, 1936.

138. Erysiphe communis Auct. Amer. On leaves of *Ranunculus acris* L. About abandoned cottage at Siasconset. Oct. 1, 1936.

139. Exidia recisa (Dittm.) Fr. On dead branch on living tree of *Quercus velutina* Lam. State Pines south of Fair Grounds, Aug. 11, 1938. Coll. & det. by *E. V. Seeler, Jr.*

140. Exoascus deformans (B.) Fckl. = *Taphrina deformans* (B.) Tul. On leaves of old seedling of *Prunus persica* Sieb. & Zucc. in yard to rear of business block on Main Street, May 30, 1937.

141. Fomes applanatus (Pers.) Wallroth. On exposed wood of trunk of large living tree of *Gleditsia triacanthos* L., Union and Coffin Streets, July 25, 1938. Coll. and det. by *E. V. Seeler, Jr.* Also collected by the author on other hosts on the island.

142. Fomes connatus (Weinman) Gillet. On exposed heartwood of *Acer Negundo* L., sidewalk tree, Pine and School Streets. Aug. 29, 1938. Coll. and det. by *E. V. Seeler, Jr.*

143. Fomes connatus (Weinman) Gillet. On trunk of *Acer rubrum* L., Hidden Forest, Aug. 5, 1938. Coll. & det. by *E. V. Seeler, Jr.*

144. Fuligo septica (L.) Weber. On bark of trunk of dead *Prunus sp.* (sweet cherry), back yard of 20 Orange Street, Aug. 19, 1938. Coll. & det. by *E. V. Seeler, Jr.* This slime mold because of its frequent occurrence on spent bark is popularly known as "flowers of tan."

145. Geaster hygrometricus Pers. In woods of *Pinus rigida* Mill., south of Town of Nantucket. May 29, 1937 (= *Astraeus hygrometricus* (Pers.) Morg.).

146. Gloeosporium nervisequum (Fckl.) Sacc. On blighted twigs of large plane tree, *Platanus occidentalis* L., corner of Ray's Court and Main Street, May 29, 1937.

This famous old tree cited in many publications on Nantucket shows the effect of many years of struggle with infections of this anthracnose fungus. Witches brooms are clustered about the entire branchwork of the tree and rhizomorphs of *Armillaria mellea* (Vahl) Quel. (see Coll. No. 1) have developed extensively under the bark at the trunk and throughout the base of the tree. This tree, with others on Main Street in the town, seems to have suffered and succumbed to a lethal influencing factor, probably illuminating gas from street mains in 1934 to 1935.

147. Gloeosporium profusum Ell. & Ev. On living leaves of *Corylus americana* Walt., Polpis, Oct. 1, 1936. Large brownish spots

with yellowish margins often limited by midrib or veins and in severe cases browning a large portion of the leaf.

148. Guignardia Bidwellii (Ell.) Viala & Ravaz. On rotted berries of cultivated grape, *Vitis vinifera* L., Nantucket town, Aug. 3, 1938. Coll. by *Grace Wyatt.*

149. Gymnosporangium Juniperi-virginianae Schw. On *Juniperus virginiana* L., Wauwinet Road out of town of Nantucket. May 29, 1937.

150. Irpex cinnamomeus Fr. On dead branch of *Quercus velutina* Lam., State Pines south of Fair Grounds. Coll. by *E. V. Seeler, Jr.* July 30, 1938. Det. by D. H. Linder.

151. Leotia chlorocephala Schw. Coll. by *Chas. P. Kimball,* Sept. 18, 1937. Det. by C. J. Gilgut.

152. Lophodermium pinastri (Schrad.) Chev. On needles of *Pinus sylvestris* L. Along Siasconset Road, May 30, 1937.

153. Merulius americanus Burt. In pine plank flooring causing destructive rot in cellar on Main Street. Oct. 31, 1937. Coll. by *E. V. Seller, Jr.* Det. by D. H. Linder.

154. Macrophoma Candollei (Berk. & Br.) Berl. & Vogl. On brown blighted fallen leaves of *Buxus sempervirens* L. Garden at 18 Orange Street. July 17, 1938. Coll. by *E. V. Seeler, Jr.* Also common in box plantings about the town according to the author's observations.

155. Microglossum fumosum (Peck) Durand. On ground, Hidden Forest, July 31, 1938. Coll. by *E. V. Seeler, Jr.* Det. by D. H. Linder.

156. Mycosphaerella punctiformis (P. ex Fr.) Schrt. On over-wintered leaves of *Fagus grandifolia* Ehrh. in Hidden Forest, May 30, 1936. Associated with *Discosia faginea* Lib.

157. Nectria cinnabarina (Tode ex Fr). On branches of *Hibiscus syriacus* L. in garden rear of Maria Mitchell Cottage, Vestal Street. Oct. 3, 1936.

158. Peronospora Viciae Auct. Amer. On living leaves of *Vicia sativa* L. in field opposite Franklin fountain along Madaket Road, May 30, 1937. This downy mildew was the cause of a blighting of the foliage.

159. Pestalotia hysteriformis B. & C. On pale brown spots on living leaves of *Quercus velutina* Lam. Border of Hidden Forest. Sept. 30, 1937. Common.

160. Phyllachora graminis (P. ex Fr.) Fckl. On *Agropyron repens* (L.) Beauv. About the "Woods" approaching the Maria Mitchell farmhouse from Madaket Road. Aug. 18, 1936.

161. Phyllachora graminis (P. ex Fr.) Fckl., var. Panici (S.) Shear. On dead over-wintered *Panicum virgatum* L. June 1, 1936.

162. Phyllosticta Epigaeae Pk. On leaves of *Epigaea repens* L., causing leaf spotting and blighting, Smooth Hummocks, May 31, 1937.

163. PHYLLOSTICTA ILLINOENSIS Tehon & Daniels. On living leaves of *Sassafras variifolium* (Salisb.) Ktze. Hidden Forest, Oct. 1, 1936. Det. by C. J. Gilgut. Brown spots, center ash gray and falling out with age, border dark, coalescing and blighting the leaves.
164. PHYLLOSTICTA OROBELLA Sacc. On leaves of *Lathyrus maritimus* Bigel. Radio Compass Station, May 31, 1937. Det. by C. J. Gilgut. Gray elliptic spots with bright purple margins.
165. PLASMOPARA PYGMAEA (Ung.) Schrt. On living leaves of *Anemone quinquefolia* L. Hidden Forest and in thickets on south side of Polpis Road out of town. May 30, 1937.
166. POLYPORUS PERENNIS (L.) Fr. On ground in Hidden Forest, Aug. 5, 1938. Coll. & det. by *E. V. Seeler, Jr.*
167. POLYPORUS SEMISUPINUS Berk. & Curt. On dead branch of *Quercus velutina* Lam. State Pines south of Fair Grounds. July 30, 1938. Coll. by *E. V. Seeler, Jr.* Det. by E. V. Seeler, Jr. and D. H. Linder.
168. POLYPORUS SULPHUREUS (Bull.) Fr. On *Gleditsia triacanthos* L. From town on Wauwinet Road. Oct. 24, 1936. Coll. and det. by *E. V. Seeler, Jr.*
169. PUCCINIA ANDROPOGONIS Schw. III. On *Andropogon scoparius* Michx. East of south end of Hummock Road. Aug. 20, 1936.
170. PUCCINIA ANGUSTATA Peck III. On *Scirpus cyperinus* (L.) Kunth. Along Long Pond near Madaket Road, Aug. 15, 1936. Very common.
171. PUCCINIA ASTERIS Duby. III. On *Aster puniceus* L. In field at Polpis near Basset Jones Estate. Oct. 1, 1936. Det. by C. J. Gilgut.
172. PUCCINIA CANALICULATA (Schw.) Lagerh. II. On *Cyperus esculentus* L. In low places bordering corn field at south end of Hummock Road. July 16, 1936.
173. PUCCINIA CORONATA Cda. II, III. On leaves of *Agropyron repens* (L.) Beauv. Along the roadside, Madaket, Aug. 16, 1936.
174. PUCCINIA GRAMINIS Pers. O, I. On leaves of *Berberis vulgaris* L., State Pines near Miacomet Pond. May 30, 1936.
175. PUCCINIA HELIANTHI Schw. III. On living leaves of *Helianthus tuberosus* L. In thicket border in field south of road to Polpis. Sept. 30, 1936.
176. PUCCINIA HIERACII (Schum.) Mart. III. On living leaves of *Taraxacum officinale* Weber. Siasconset about cottages. Oct. 1, 1936.
177. PUCCINIA INVESTITA Schw. II. On leaves and stems of *Gnaphalium polycephalum* Michx. In fields west of south end of Hummock Pond. Common all over the Island destroying the lower leaves of this plant. Aug. 16, 1936.
178. PUCCINIA IRIDIS (DC) Wallr. III. On living leaves of *Iris versicolor* L., Hidden Forest. Aug. 15, 1936. Common and destructive in this locality.

179. Puccinia malvacearum Bert. III. On *Althaea rosea* (L.) Cav. In border planting in garden, Nantucket town. Aug. 15, 1936.
180. Puccinia malvacearum Bert. III. On *Malva rotundifolia* L. Around shops on water front in Nantucket town. May 30, 1937.
181. Puccinia rubigo-vera (DC) Wint. var Agropyri (Erikss.) Arthur II. On leaves and stems of *Holcus lanatus* L. Long Pond, near Madaket Road, Aug. 15, 1936.
182. Puccinia rubigo-vera (DC) Wint. var. Agropyri (Erikss.) Arthur III, associated with *Puccinia coronata* Cda. III. On leaves of *Agropyron repens* (L.) Beauv. Roadside, Madaket. Aug. 15, 1936. Some of the telial stage of both species also present.
183. Puccinia rubigo-vera (DC) Wint. var. Secalis (Erikss.) Carl. II. On *Secale cereale* L. near Franklin fountain, Madaket Road, May 30, 1937. Very common.
184. Puccinia Seymouriana Arth. II, III. On *Spartina Michauxiana* Hitchc. Along Long Pond, Madaket. Aug. 12, 1936.
185. Puccinia Sorghi Schw. II. On *Zea Mays* L., occurring in epidemic fashion and rendering the foliage conspicuously red from the distance. On farm at south end of Hummock Road. Aug. 15, 1936.
186. Pucciniastrum pustulatum (Pers.) Diet. II, III. On *Epilobium densum* Raf. South of Coskata Pond, Aug. 16, 1936.
187. Ramularia Taraxaci Karst. On living leaves of *Taraxacum officinale* Weber. Siasconset about cottages. Oct. 1, 1936.
188. Rhytisma Curtisii B. & Rav. On living leaves of *Ilex opaca* Ait. Hidden Forest, May 29, 1936. Coll. by *Mrs. E. F. Guba.* Det. by D. H. Linder. Fungus common in this locality at this season appearing as reddish cushions breaking through the upper leaf surface.
189. Russula emetica Fr. Coll. by *James P. Kimball* in woods near his residence. Sept. 18, 1937. Det. by C. J. Gilgut.
190. Scodellina leporina (Batsch) S. F. Gray. Abundant in leaf mold on ground. Hidden Forest, July 31, 1938. Coll. and det. by *E. V. Seeler, Jr.*
191. Septoria **Plucheae**, sp. nov., maculae orbiculares pallide brunneae interdum translucentes margine obscuro purpurascente vel rubescente, usque 0.5 cm. diametro, coalescentes; pycnidiis atris, globosis, minutis, punctiformibus, amphigenis, 70–110 μ diametro; conidiis multiseptatis, anguste filiformibus et ad apicem fastigiatis, curvulis, 30–63 x 1.5 μ.

Spots on leaves pale brown with indefinite purplish or reddish border, sometimes somewhat transparent, circular, up to .5 cm. in diam., coalescing and blighting the leaves. Pycnidia black, globose, minute, punctiform, amphigenous, rather sparse, 70–110 μ in diam. Conidia narrowly filiform or linear and tapering at the apex, multiseptate, somewhat curved, 30–63 x 1.5 μ.—

On living leaves of *Pluchea camphorata* (L.) DC. in marshy area bordering Coskata Pond. Aug. 16, and Oct. 1, 1936. Fungus causes circular leaf spots with purple margins in severe cases blighting and defoliating the plants.

192. Septoria **Ligustici,** sp. nov., pycnidiis 60–100 μ diametro, amphigenis numerosis atris, globosis punctiformibusque, in maculis irregularibus; conidiis continuis, linearibus plerumque 12–22 rare usque 28 μ longitudine, 1.5 μ diametro.

Pycnidia 60–100 μ in diam., amphigenous, numerous, black, globose, punctiform, in irregular spots with indefinite borders and often with pale centers coalescing and blighting the leaves, similar to Septoria celery blight excepting that pycnidia are less conspicuous. Conidia continuous, linear, usually rather short, 12–22 x 1.5 or rarely up to 28 μ long.—On blighted leaves of *Ligusticum scothicum* L. about Capaum Pond. Oct. 1, 1936.

193. Sphaeropsis Ellisii Sacc. On dead cut-off branches of *Pinus rigida* Mill. between Hummock and Miacomet Ponds, May 30, 1936. Coll. by *C. J. Gilgut.*

194. Sphaeropsis Smilacis Ell. & Ever. On spots on living leaves of *Smilax rotundifolia* L. In thicket at Polpis, Oct. 1, 1937, with *Diplodia Smilacina* B.

195. Steganosporium acerinum Pk. On dead twig of *Acer Pseudo-Platanus* L. in yard on Fair Street in town. Aug. 19, 1937. Coll. & det. by *E. V. Seeler, Jr*

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Waltham, Mass.

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QUERCUS RUBRA ONCE MORE

H. K. Svenson

For nearly 150 years the well-known timber tree of eastern United States was recognized as *Quercus rubra,* but in 1915 Sargent[1] used the name *Q. rubra* for the southern tree previously known as *Q. falcata* Michx. And recently Rehder[2] has entirely rejected the name *Q. rubra* on the ground that it is a *nomen ambiguum* "based by Linnaeus (Spec. Pl. **2**: 996. 1753)[3] on two different species. The first two synonyms refer to the southern red oak or Spanish oak . . . , while the two synonyms enumerated by Linnaeus under β are apparently referable to the northern red oak. Du Roi in 1771 (Obs. Bot. 35) applied *Q. rubra* L. to the northern red oak. . . " This quotation from Rehder (l. c.) explains succinctly the arguments of Sargent.

In my opinion both procedures were unnecessary, and I believe that we should apply the name *Quercus rubra,* as formerly, to the northern tree.

Sargent was correct in attaching great importance to the first

[1] Rhodora xvii. 39–40 (1915), xviii. 45–48 (1916).
[2] Journ. Arnold Arb. xix. 283–284 (1938).
[3] QUERCUS foliis obtuse-sinuatis setaceo-mucronatis.
Quercus foliorum sinubus obtusis: angulis lanceolatis seta terminatis integerrimis vix divisis. *Gron. virg.* 117.
Quercus esculi divisura, foliis amplioribus aculeatis. *Pluk. alm.* 309. *t.* 54. *f.* 4. *Catesb. car.* I. *p.* 23. *t.* 23.
β Quercus foliorum sinubus obtusis: angulis acutis seta terminatis: intermediis vix tridentatis margine integerrimo. *Hort. cliff.* 448. *Roy. lugdb.* 80.
Quercus carolinensis, virentibus venis muricata. *Catesb. car.* I. *p.* 21. *t.* 21. *f.* 1.
Quercus virginiana venis rubris muricata. *Pluk. alm.* 309. *t.* 54. *f.* 1 [mistake for f. 5].
Habitat in Virginia, Carolina

synonym cited, as did Linnaeus.[1] This first reference is to Gronovius (1739):

> Quercus *foliorum sinubus obtusis, angulis lanceolatis seta terminatis integerrimis vix divisis.*
>
> Quercus Esculi divisura, foliis amplioribus aculeatis. *Plukn. Alm.* p. 309. t. 54 f. 4. **Red-oak.** Catesb. Hist. Carol. vol. I. t. **32.**
>
> Quercus rubra seu Hispanica hic dicta, foliis ampliis varie profunde-que incisis. *Clayt.*

It will be seen that this reference is based only in small part on Clayton (cited last and without number). Catesby's rather crude figure, with a verbatim copy (!) of Plukenet's phrase-name as legend, Sargent has taken as representing *Q. falcata*, but Suringar, Mededeel. Herb. Leiden no. 56, p. 11 (1928), identifies it as either *Q. Catesbaei* or *Q. digitata* and includes illustrations of the Catesby specimen at the British Museum to strengthen his point. "Clayton's specimen is clearly the digitate form of *Quercus falcata*" (Sargent, p. 39, 1915), but there is also "a specimen of a single leaf of *Quercus velutina*" which Sargent believed "may not have been collected before 1753"; thus the Clayton reference potentially includes two distinct species. But many years had elapsed since Linnaeus had seen the Clayton specimens, if at all, and he did not have them before him when writing *Species Plantarum*. Furthermore, there is no indication whatever that Linnaeus, or even Gronovius, derived the diagnostic phrase [specific name] from a Clayton specimen, as Sargent implies. The second synonym in Linnaeus' treatment refers entirely to the Plukenet and Catesby citations and adds nothing.

Now as to the second part (β) of the Linnaean treatment. That was based primarily on the citation from Hortus Cliffortianus, which in turn "is based on the description and figures of Plukenet and Catesby, and on a specimen presumably from Clifford's garden now preserved in the British Museum" [Sargent, p. 46 (1916)]. This specimen, according to Sargent, represents the northern Red Oak. The very crude figure by Catesby of *Quercus carolinensis, virentibus venis muricata,* probably follows Plukenet's figure, emphasizing green veins instead of red.

[1] Cf. Critica Botanica 259 (1737): "Cum Synonyma plantarum varia proponemus ejusdem speciei, necesse est, ut primus locus concedatur Synonymo optimo . . . de reliquis succedentibus non item, debent enim ista secundum nomina generica disponi." [When various synonyms are proposed for the same species, it is necessary to give first place to the best synonym . . . those following may be arranged according to their generic names.]

In this analysis it will be seen that Linnaeus' emphasis falls on the original figures and citations by Plukenet, but the Plukenet specimens are not to be found at the British Museum. Fig. 5, as the "scarlet oake", was drawn from young trees raised from acorns in Compton's garden, judging from Plukenet's explanations. This figure probably represents a leaf of the northern red oak (cf. Sargent, 1916, p. 46) in its sprout form. Fig. 4 represents a conventionalized dissected leaf of the red-oak series, questionably associated by Plukenet with Parkinson's vague illustration of the white oak of Virginia; it could represent, as well as anything else, the normal foliage of the northern red oak. It is interesting to note that Linnaeus, in his own copy of Plukenet, kindly shown to me by Mr. Savage, has written "rubra" beneath both figures 4 and 5.

Around these two figures of Plukenet, representing respectively the dissected and merely scalloped leaves of the red-oak series, I believe Linnaeus and Catesby formed their ideas, the Linnaean phrase *foliis obtuse-sinuatis setaceo-mucronatis* being a phrase-name [i.e. specific name] constructed according to the rule set up by Linnaeus ("*Nomen specificum plantam ab* omnibus congeneribus *distinguat*," Cf. Critica Botanica 148 (1737) and Philosophia Botanica §§ 159, 257 (1751)), to distinguish the red oak from the chestnut, white, and black oaks. My opinion is close to that of Suringar (l. c., p. 11): "Probably LINNAEUS has not seen CATESBY'S and PLUKENET'S plants, but has built his *Q. rubra* from their drawings." *Species Plantarum* was to a large extent a *compendium* of previously published descriptions and figures, and Linnaeus placed much weight on the illustrations of Plukenet's "opus incomparabile." In the Linnaean Herbarium *Quercus rubra* is represented by three sheets. Two of these (nos. 23, 24) from Kalm, have been discussed by Sargent (1916) and are identifiable either as *Q. palustris* or *Q. coccinea.* The third sheet (no. 22), also from Kalm, has on the reverse side the notation in Linnaeus' hand "Quercus foliorum sinubus obtusis, angulis lanceolatis seta terminatis integerrimis (vix divisus deleatus [?] et legatus [?]) subtus tomentosus." This specimen with a densely tomentose lower surface represents *Q. falcata* Michx., and was identified by James Edward Smith as "*Q. discolor* H. Kew."

At any rate, a TYPE from this assemblage of red-oak species[1] of

[1] Also, Professor Fernald and Mr. Long have during the past year collected perfectly good material of *Q. rubra* (the northern tree) in Clayton's region of eastern Virginia.

eastern America was long ago selected and adequately described and illustrated by DuRoi,[1] who cited references to Linnaeus, Miller, and Plukenet's *Quercus esculi divisura, foliis amplioribus aculeatis!* The bark of the tree was described as smooth, the leaves "hellgrün und glatt," and the acorns over an inch long and an inch wide, quite evidently the northern tree. Sargent again selected a type in 1915; but DuRoi had already done so in 1772. Nothing but confusion results in an attempt in this case to base two distinct species upon the Linnaean treatment.

The name of the northern red oak should therefore in my opinion be *Quercus rubra* L. Sp. Pl. i. 996 (1753)[2]; DuRoi, Harbk. Baumz. 265 (1772); Robinson & Fernald in Gray, Man. ed. 7, 342 (1908).

The first intelligible treatment of the southern tree, as a species, seems to be Quercus falcata Michx. Hist. Chên. Am. 16, t. 28 (1801), as generally recognized.

Brooklyn Botanic Garden,
Brooklyn, New York

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XVIII

Norman C. Fassett

Myriophyllum verticillatum L., var. **Cheneyi**, n. var., staminibus 4; bracteis 4–9 mm. longis.—Wisconsin (specimens in Herb. Univ. of Wis.): LaPoint, Madeline Island, July 30, 1896, *L. S. Cheney*, no. 5580 (type) and no. 5594; Port Wing, July 10, 1897, *Cheney*, no. 7145. New York (specimens in Gray Herbarium): in Hudson River, Mechanicville, Saratoga County, August 28, 1932, *W. C. Muenscher & A. A. Lindsey*, no. 3465; in cove of Hudson River, Coveville, August 28, 1932, *Muenscher & Lindsey*, no. 3466.

Stamen-number is ordinarily diagnostic in *Myriophyllum*, and is used as a primary character in separating species by Schindler.[3] *M. verticillatum* ordinarily has 8 stamens, and the plant here described is placed, by its 4 stamens, in *M. hippuroides* with most keys. Its pectinate bracts place it in the former species.

Mimulus glabratus HBK., var. **michiganensis** (Pennell), n. comb. *M. glabratus* [subsp.] *michiganensis* Pennell, Acad. Nat. Sci. Mon. i. 119 (1935).

[1] Die Harbkesche . . . Baumzucht 265 (1772).
[2] If more accurate citation is desired, *Q. rubra* L. emend. DuRoi.
[3] Pflanzenreich iv. fam. 225: 78, 80 (1905).

Originally described from the northern extremity of the southern peninsula of Michigan, this may now be recorded from Mackinac County in the Upper Peninsula as follows: broad wet sandy shore of Lake Michigan, Epoufette, September 11, 1932, *Fassett*, no. 14745 (identified as *michiganensis* by Dr. Pennell); seepy banks, beach of Lake Michigan, Brevort, July 9, 1934, *M. L. Fernald & A. S. Pease*, no. 3515; springy shores, upper beach of Lake Michigan, between Epoufette and Brevort, August 1, 1938, *Fassett*, no. 19403. The last collection was noted in the field as having the tube spotted with light brown within and without, but otherwise it agrees with the description.

Another variety with flowers sometimes as large as those of var. *michiganensis*, with leaves like those of var. *Fremontii* (Benth.) Grant, and with pedicels more than twice as long as the subtending leaves, may take the name of

M. GLABRATUS var. **oklahomensis**, n. var., foliis orbiculatis subcordatis marginibus subintegris vel sinuatis; pedicellis 15–27 mm. longis, quam bracteis duplo longioribus; corolla 10–17 mm. longis.—OKLAHOMA: Hinton, in Caddo Canyon, Caddo County, April 26, 1936, *Delzie Demaree*, no. 12338 (TYPE in Gray Herbarium); in edge of small creek, near Alva, Woods County, April 16, 1934, *G. W. Stevens*, no. 3010; in shallow pond near Doby Springs, Harper County, May 5, 1913, *Stevens*, no. 315.

VERONICA CONNATA Raf., var. **glaberrima** (Pennell), n. comb. *V. connata* [subsp.] *glaberrima* Pennell, l. c., 368.

PHYSOSTEGIA **Nuttallii** (Britton), n. comb. *Dracocephalum Nuttallii* Britton in Britton & Brown, Ill. Fl. ed. 2, iii. 117 (1913).

PODOSTEMUM IN NORTH AMERICA. *Podostemum* ranges from the Ottawa River and central Maine southward to Delaware, and from eastern Kentucky to southern Georgia and southwestern Arkansas. The following specimens are in the herbaria of the New York Botanical Garden and of the University of Wisconsin; in this enumeration they are numbered for reference.

ONTARIO or QUEBEC: (1) upper part of Ottawa River, Canada, August, 1896, *F. F. Allen*. QUEBEC: (2) Hull, September 1, 1894, *John Macoun;* (3) Ile Bizard, Montreal, 19 September 1925, *Marie-Victorin*, no. 22081; (4) St. Eustache, August, 1916, *Marie-Victorin*, no. 3212. MAINE: (5) Chemo Stream, Bradley, October, 1898, *E. D. Merrill;* (6) Collins Dam, West Gardiner, August 18, 1936, *N. C. Fassett*, no. 18295. MASSACHUSETTS: (7) South Natick, August 3, 1880, *E. & C. E. Faxon;* (8) South Natick, September 11, 1878, *Thomas Morong*. CONNECTICUT: (9) Farmill River, Huntington, July 16, 1905, *E. H. Eames*, no. 5290. NEW YORK: (10) Grasse River

rapids below Massena, St. Lawrence County, September 4, 1930, *W. C. Muenscher & Bassett Maguire*, no. 1198; (11) St. Regis River, Hogansburg, Franklin County, September 6, 1930, *Muenscher & Maguire*, no. 1197. NEW JERSEY: (12) "Pretty Brook," Princeton, [Torrey Herbarium]; (13) Stocton, August 30, 1895, *H. L. Fisher*. PENNSYLVANIA: (14) West Chester, *W. Darlington;* (15) Martins Creek, Northampton County, *C. S. Williamson;* (16) Winona Falls, near Bushkill, September 6, 1938, *N. C. Fassett & H. H. Calvert*, no. 19488; (17) same data, no. 19489. DELAWARE: (18) Brandywine Creek, Newcastle County, July, 1866, *A. Commons;* (19) Red Clay Creek, Greenbank, September 2, 1884, *Commons;* (20) same data, August 13, 1884. KENTUCKY: (21) near Harlan Court House, Harlan County, August 1893, *T. H. Kearney, Jr.* TENNESSEE: (22) Unaka Mt., *Dr. A. Gattinger*. NORTH CAROLINA: (23) Rainbow Falls, west of Chimney Rock, Rutherford County, July 30, 1933, *Edgar T. Wherry;* (24) French Broad River at Hot Springs, Madison County, July 8, 1898, *Biltmore Herbarium*. GEORGIA: (25) Estotoak Falls, August 11, 1893, *J. K. Small;* (26) Tallulah Falls, Rabun County, alt. 1500–1600 ft., Sept. 3–6, 1894, *Small;* (27) Flint River, Albany, *Chapman;* (28) Falls of the Chatahoochie, Columbus, [Torrey Herbarium]; (29) Chattahoochie River, *Dr. Boykin;* (30) Muckafoonee Creek, Dougherty County, alt. 170 ft., August 26, 1903, *R. M. Harper*, no. 1950. ALABAMA:(31) fertile in fluv. Coosa dit. Clair Cy., sterile in "Chiokwa Creek," September, 1843, *Rugel;* (32) River Falls, Covington County, June 23, 1906, *Harper*, no. 106; (33) Mussel Shoals, Florence, October 18, 1922, *Harper*. MISSISSIPPI: (34) Meridian, June 3, 1897, *S. M. Tracy*, no. 3262; (35) Enterprise, June 12, 1897, *Tracy*, no. 3257. ARKANSAS: (36) Caddo Gap, Montgomery County, April 20, 1937, *V. M. Watts & N. C. Fassett*, no. 18693.

A collection extending the range westward into southeastern Oklahoma is reported from McCurtain County.[1] It is commonly reported as occurring northwestward to Minnesota; Dr. Rosendahl writes me that the report from Minnesota is based upon a specimen, which he has not seen, from Lake Pepin. The writer knows of no habitat suitable for *Podostemum* in the vicinity of Lake Pepin. The locality in Arkansas was visited again in the summer of 1937 by Dr. and Mrs. Watts, in hope of finding fruit. The plant, which in April had thickly clothed the boulders in the stream, had completely disappeared, perhaps because of the grinding action in a recent flood. There was none to be found there in April, 1938, when Dr. Watts and the writer looked for it.

P. CERATOPHYLLUM Michx., f. **abrotanoides** (Nutt.), n. comb. *P. abrotanoides* Nutt., Journ. Nat. Sci. Phila. vii. 105 (1834).

[1] Little & Olmsted, Proc. Okla. Acad. Sci. xv. 47 (1935).

P. CERATOPHYLLUM, f. **chondroides**, n. f., plantae rigidae; caulibus simplicibus 1.5–8 cm. longis 1 mm. diametro; foliorum segmentis ad 1.5 cm. latis, ultimis 0.35–0.60 mm. latis et 1–3-plo longioribus. TYPE, in the Herbarium of the University of Wisconsin, is number 16 listed above. No. 17, growing in the same brook but in different patches, is f. *abrotanoides*.

These two forms represent, respectively, the most slender, lax and elongate, and the most coarse and rigid extremes of the species. There is little resemblance between them; one suggests a *Ruppia*, and the other a *Chondrus*. But a series of intermediates connects these two, and on no characters do these plants seem to resolve into two distinct entities. *P. abrotanoides* has been described as a southern species, but plants inseparable, except perhaps in maximum length of stem, from those of Mississippi and Georgia, have been collected in Quebec. The arguments for considering the genus as represented in eastern North America to consist of but one highly variable species are outlined in the following discussion of characters.

Fruits, as found on most herbarium sheets, are represented by the one persistent carpel devoid of seeds. This carpel is uniform in all specimens examined, being always 5-ribbed on the exterior, with the interior smooth and lustrous. The distribution of flowers or fruits on the plants is not so uniform. *P. ceratophyllum* has been characterized[1] as having flowers single or scattered, and *P. abrotanoides* distinguished by having them clustered at the end of the stem. But in many cases they are more or less grouped at or near the end of the stem, with solitary ones below. Perhaps the most definite example of a terminal cluster is found on collection 1 listed above; this is from the extreme northern station for *Podostemum!*

What appears at first sight to be a clear character is the inclusion in the spathe of most or all of the pedicel of the mature fruit in most of the material identified as *P. abrotanoides*. In some northern material the fruits are well exserted on pedicels up to 8 mm. long. However, included pedicels are the rule on no. 9 from Connecticut, 10 from New York, 14 from Pennsylvania, 29 from Georgia, and 31 from Alabama, and the fruits are definitely long-pedicelled in no. 1 from Canada and 30 from Georgia. In no. 2 from Quebec, 5 from Maine, 13 from New Jersey, 21 from Kentucky, and 35 from Mississippi, there are included, short-exserted, and long-exserted pedicels associated on the same plant. On most individuals the pedicels are terete, on some they are winged, and on others both types occur.

[1] N. Am. Fl. xxii. pt. 1: 6 (1905).

The stipules are typically adnate below to the petiole as a pair of scarious marginal wings, and above connate and free from the petiole to form a ligule-like outgrowth. On a few specimens from widely separated points (no. 3 from Quebec, 10 & 11 from New York, 34 & 35 from Mississippi) they seem not to be developed. On occasional individuals (no. 6 from Maine and 15 from Pennsylvania) they are well developed on some leaves and absent from others.

Leaf-segments have been used in distinguishing two species, those of *P. ceratophyllum* being characterized as flat, while those of *P. abrotanoides* are described as filiform. But in all specimens they are actually flat. The following measurements of the terminal segments of leaves of pressed material of what is here considered typical *P. ceratophyllum* were made with a compound microscope and micrometer eyepiece. No. 6 from Maine and 7 from Massachusetts, width 350 microns; 8 from Massachusetts, 120–170 microns; 13 from New Jersey, 150–200 microns; 18 from Delaware, 150–180 microns; 20 from Tennessee, 250–300 microns; 23 from North Carolina, 200 microns; 24 from North Carolina, 110–200 microns; 30 from Georgia, 200 microns. *P. ceratophyllum* f. *abrotanoides*, as distinguished in the key below, occurs throughout the range of *P. ceratophyllum*, and its ultimate leaf-segments average a little narrower, as follows: no. 2 from Quebec, 250 microns; 3 from Quebec, 150 microns; 4 from Quebec, 120 microns; 9 from Connecticut, 150–200 microns; 10 from New York, 150 microns; 11 from New York, 100–150 microns; 29 from Georgia, 100 microns; 34 from Mississippi, 100–200 microns; 35 from Mississippi, 120–180 microns.

In the following key, the forms of the extremely variable *P. ceratophyllum* are rather arbitrarily placed in three groups on a basis of habit. The form taken as typical is the one illustrated by Michaux,[1] and is intermediate between the extremes.

a. Terminal segments of leaves many times as long as broad, very narrowly ribbon-like, 100–350 microns wide at tip . . . . *b.*
  b. Plant rather rigid; stems rarely exceeding 1.5 dm. in length; leaves spreading at an angle, often absent from the lower part of the stem . . . . . *P. ceratophyllum* (typical).
  b. Plant lax; stems reaching 8 dm. in length; leaves loosely ascending, usually borne along the whole length of the stem . . . . . *P. ceratophyllum* f. *abrotanoides.*
a. Terminal segments of leaves 1–3 times as long as broad, 350–600 microns wide at tip . . . . . *P. ceratophyllum* f. *chondroides.*

For loans of material of *Myriophyllum* and of *Podostemum* the

[1] Fl. Bor.-Am. ii. 165 (1803).

Photo. W. H. Hodge

CYPERUS FLAVESCENS: FIG. 6, achenes, × 10, from Maritime Alps: FIG. 7. surface of achene, × 70, from Maritime Alps.

Var. POAEFORMIS: plant, × 1, from New Jersey; FIG. 2, achenes, × 10, from Virginia; FIG. 3, surface of achene, × 70, from Virginia.

Var. PICEUS: FIG. 4, achenes, × 10, from Mexico; FIG. 5, surface of achene, × 70, from Mexico.

Photo. W. H. Hodge

APIOS AMERICANA: FIG. 3, inflorescence, × 1, from New York.
Var. TURRIGERA: FIG. 1, inflorescence, × 1 from Virginia (TYPE); FIG. 2, inflorescences, × 1, from South Carolina.

writer is indebted to the curators of the Gray Herbarium and of the New York Botanical Garden.

LAST SURVIVORS IN THE FLORA OF TIDEWATER VIRGINIA

M. L. Fernald

(*Continued from p. 504*)

Cenchrus tribuloides L. Extending up the James to Surry County: sand-beach, Claremont Wharf, no. 8950.

Erianthus strictus Baldwin. Range extended inland to Greensville County: pond-hole in pine and oak woods near Three Creek, north of Emporia, no. 9241.

Reported in 1938 as new to Virginia. Now known to us as one of the commoner species of the region from York and Prince George Counties southward. Much earlier than the plumose species, flowering chiefly from July to September and quickly identified from the moving car by its slender and stiff plumeless panicle.

E. compactus Nash. Range extended inland from Sussex County to Dinwiddie and Greensville Counties.

Arthraxon hispidus (Thunb.) Makino, var. cryptatherus (Hackel) Houda. To the station in Elizabeth City County add one in Sussex County: turfy right-of-way by railroad, Jarratt, no. 9517.

*Manisuris rugosa (Nutt.) Kuntze. Sussex County: exsiccated argillaceous pineland about 2 miles east of Stony Creek, no. 8916.

An interesting station, connecting those of the Carolinas with the northern outliers in Delaware and southern New Jersey. See p. 476.

Cyperus flavescens L., var. **poaeformis** (Pursh), comb. nov. *C. poaeformis* Pursh, Fl. Am. Sept. i. 50 (1814). Plate 574, figs. 1–3.

C. flavescens L., var. **piceus** (Liebm.), comb. nov. *C. piceus* Liebm. in Vidensk. Selsk. Skr. Kjøbenh. ser. V. ii. (1851) 200. Plate 574, figs. 4 and 5.

True *Cyperus flavescens* of Eurasia and Africa has the mature achenes (figs. 6 and 7) blackish-brown, with vertical rows of oblong superficial cells and at most very obscure and tardily developed transverse zonation. In outline they are broadly obovate and (including stipe and apiculation) close to 1 mm. long. The plant of eastern North America, on the other hand, has achenes (figs. 2 and 3) with more prominent reticulation, the transverse ridges pronounced and in maturity becoming white bands of mineral substance suggesting

lines of frost-crystals; the body of the achene being black. In outline the achenes of this eastern North American plant (*C. poaeformis*) are rather narrowly obovoid or even ellipsoid and they measure 1–1.2 mm. long. This plant, var. *poaeformis*, extends from the West Indies and Florida to Texas, northward to southeastern New York, Pennsylvania, Ohio, Michigan, Illinois and Missouri.

In South America and Mexico *Cyperus flavescens* may have darker scales than in Europe or in the United States, but this character completely breaks down, although upon color alone Kükenthal in Engler, Pflanzenr. iv[20]. 395, 396 (1935) maintains *C. piceus* Liebm. as a species. This Mexican and South American material, inseparable in habit, spikelets and scales from *C. flavescens* and its var. *poaeformis* (the darkening of the scales being too instable a character), has achenes (FIGS. 4 and 5) intermediate between those two: dark-brown to black, broadly obovoid, 0.9–1 mm. long, with reticulation prominent but with the white transverse ridges less developed than in var. *poaeformis* or the white quite wanting. It seems to me a reasonably good tropical American variety. Var. POAEFORMIS abounds in eastern Virginia.

In PLATE 574, FIG. 1 is a plant, × 1, of *Cyperus flavescens*, var. *poaeformis*, from Cold Spring, New Jersey, *Gershoy*, no. 119; FIG. 2, achenes, × 10, from Virginia, *Fernald & Long*, no. 9277; FIG. 3, surface of achene, × 70, of no. 9277. FIG. 4 is a group of achenes, × 10, of var. *piceus*, from Mexico, *Pringle*, no. 11,299; FIG. 5, surface, × 70, of one of these achenes. FIGS. 6 and 7 show achenes, × 10, and their surface, × 70, of the European (typical) *C. flavescens*, from the Maritime Alps, *Moggridge*.

CYPERUS POLYSTACHYOS Rottb., var. **texensis** (Torr.), comb. nov. *C. holosericeus* Link, Hort. Berol. i. 317 (1827), fide Kükenthal. *C. microdontus* Torr. in Ann. Lyc. N. Y. iii. 255 (1836). *C. Gatesii* Torr. l. c. (1836). *C. microdontus*, β. *Texensis* Torr. l. c. 430 (1836). *C. fugax* Liebm. in Vidensk. Selsk. Skr. Kjøbenh. ser. 5: 196 (1851). *C. inconspicuus* Liebm. l. c. 197 (1851). *C. Liebmanni* Steud. Syn. Cyp. 7 (1855). *C. Texensis* (Torr.) Steud. l. c. 9 (1855). *C. polystachyus*, β. *Leptostachyus* Boeckel. in Linnaea, xxxv. 478 (1868); Kükenth. in Engler, Pflanzenr. iv[20]. 371 (1935). *Pycreus polystachyus*, var. β. *laxiflora* C. B. Clarke in Urb. Symb. Antill. ii[1]. 17 (1900). *C. filicinus*, var. *microdontus* (Torr.) Fernald in RHODORA, xix. 153 (1917).

There seems to me no question that our annual plant, varying from individuals with single tall culms to low and matted extremes, but always with linear spikelets only 1.2–2 mm. broad, the membranous dull obtuse or merely subacute and barely mucronulate scales 1.5–2

mm. long and the achenes only 0.8–1 mm. long, is a variety of the pantropical *Cyperus polystachyos*. It has been called many species, Torrey giving it at least three names; but accumulated material shows it, like other annuals, to be very plastic. The International Rules of Nomenclature require us to use the earliest published valid name in each category of classification. *C. microdontus*, β. *Texensis* Torr. (1836) was based on immature material (before me) of the eastern American plant and the Drummond material upon which it was based is cited by Kükenthal under var. *Leptostachyus*, which was not published until 1868.

Dwarf extremes of *Cyperus filicinus* Vahl (1806) (*C. Nuttallii* Eddy (1820)) simulate dwarfed plants of *C. polystachyos*, var. *texensis*, and on some of the Cape Cod ponds they are intermixed. It was this mixed material which lead me to reduce *C. microdontus* Torr. to varietal rank under *C. filicinus*. Boeckeler had a similar feeling about the two plants when he treated *C. filicinus* as *C. polystachyus*, var. *Macrostachyus* in Linnaea, xxxv. 479 (1868). *C. filicinus* is essentially a maritime species of Atlantic North America. *C. polystachyos*, var. *texensis* is tropical, extending northward in fresh (acid) soils to Cape Cod. I separate the two as follows.

C. FILICINUS. Spikelets linear-lanceolate, 1.5–3 mm. broad; scales 2–3.5 mm. long, oblong-lanceolate, subcoriaceous, lustrous, acute, prominently mucronate; achenes 1.2–1.4 mm. long.

C. POLYSTACHYOS, var. TEXENSIS. Spikelets linear, 1.2–2 mm. broad; scales 1.5–2 mm. long, narrowly elliptic-ovate, membranaceous, dull, obtuse or only subacute, barely mucronulate; achenes 0.8–1 mm. long.

Upon Curtiss, no. 3050, from Indian River, Florida, Kükenthal set up *Cyperus filicinus*, forma *splendens* Kükenth. in Engler, Pflanzenr. iv^{20}. 374 (1935). The sheet in the Gray Herbarium is inseparable from large extremes of *C. polystachyos*, var. *texensis* (such as *Curtiss*, no. 3049), except in its prolonged spikelets. Var. TEXENSIS is common in eastern Virginia.

C. STRIGOSUS L., var. ROBUSTIOR Britton. HENRICO COUNTY: sphagnous springy swales bordering Whiteoak Swamp, west of Elko Station, no. 8968. GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, no. 8969.

Seen by us only in these two sphagnous areas, the very tall culms usually solitary, the very slender spikelets up to 4 cm. long.

C. FILICULMIS Vahl., var. OBLITUS Fern. & Grisc. Range extended

inland to SOUTHAMPTON COUNTY: dry white sands east of Drewryville, south of Franklin and south of Sebrell, many nos.

ELEOCHARIS TENUIS (Willd.) Schultes, var. PSEUDOPTERA (Weatherby) Svenson. DINWIDDIE COUNTY: rich deciduous woods about old marl-pits east of Burgess Station, no. 9838. See p. 492.

Svenson's map 30, in RHODORA, xli. 53 (1939), indicates this characteristic plant as known in Virginia only on the Potomac.

E. ALBIDA Torr. To the two previously recorded stations (on the coasts of Northampton and Princess Anne) add one in SURRY COUNTY: sandy tidal shore of Crouch Creek, east of Scotland, no. 8584 (culms wiry). See p. 467 and MAP 3.

*SCIRPUS NOVAE-ANGLIAE Britton. SURRY COUNTY: tidal marsh at mouth of Crouch Creek, east of Scotland, no. 8593.

First station from south of the lower Delaware. Whether or not the species can finally be maintained, the occurrence of this plant, characteristic of the coast of eastern Canada and New England, close to northern colonies of *Eleocharis albida* and with *Aeschynomene virginica* is at least noteworthy. See p. 467 and MAP 2.

S. FONTINALIS Harper, var. **virginiana**, var. nov., a varietate typica differt inflorescentiae ramis ramulisque valde adscendentibus.—Calcareous springheads, alluvial woods and cypress swamps, Surry County, VIRGINIA: calcareous meadow near head of Sunken Meadow Creek, south of Claremont, April 10, 1938 (scarcely in anthesis), *Fernald & Long*, no. 7761; along rills and about springs, rich calcareous woods at head of Sunken Meadow Creek, June 12 and 13, 1938 (overripe), no. 8108; wooded calcareous springheads, Claremont Wharf, May 20,1939 (in anthesis), no. 9839 and June 22, 1939 (overripe), no. 10,143; alluvial woods along Gray's Creek, west of Old Courthouse Corners, May 20, 1939 (mature), no. 9840 (TYPE in Herb. Gray, ISOTYPE in Herb. Phil. Acad.); border of cypress swamp, along College Run, about 1 mile west of Highgate, May 20, 1939 (in anthesis), no. 9841.

When this most interesting plant was discovered in 1938 it was identified, in spite of departure in habit of the terminal umbel, with *Scirpus fontinalis* of calcareous wooded springheads of Georgia, about 450 miles to the southwest (see RHODORA, xl. 376, 382 and 396 (1938)). We now find the Virginian plant thoroughly typical and always to be expected in the calcareous springheads and floodplains of creeks throughout the belt of fossiliferous Miocene marl-beds of Surry County; it presumably extends into Prince George at the west and into Isle of Wight at the east. All the collections are consistent in having strongly ascending rays of the terminal umbel and the latter

is rather denser than in the Georgian plant, in which the rays are more elongate and strongly divergent (as shown in *Harper*, no. 2185), thus suggesting the inflorescence of *S. divaricatus*. I can find no appreciable differences in foliage, spikelets and achenes, the latter remarkable for their very prolonged beaks. See p. 492 and MAP 15.[1]

RHYNCHOSPORA MACROSTACHYA Torr. Very local in southeastern Virginia; besides Grimes's stations on Lake Drummond and on the Chickahominy River we know only the following. PRINCE GEORGE COUNTY: muddy tidal shore of James River, Jordan Point, no. 8983 (plants 1.8 m. high).

Throughout the area *Rhynchospora corniculata* abounds, and often simulates *R. macrostachya*. The luxuriant development of the latter in tidal mud of the James, where it is associated with such halophytic species as *Sagittaria falcata*, is noteworthy. In New England the species is confined to the most acid of peats. See p. 475.

R. PERPLEXA Britton. Recorded in 1938 as new to Virginia. To the stations there noted add the following. GREENSVILLE COUNTY: pond-hole in pine and oak woods near Three Creek, north of Emporia, no. 9282.

R. CADUCA Ell. Previously recorded from two stations only (in Norfolk and Sussex Counties). Now known as occasional colonies (often quite extensive) northward to YORK and GLOUCESTER COUNTIES and inland to SOUTHAMPTON COUNTY (many nos.). See p. 467.

R. TORREYANA Gray. Recorded in 1937 as new to Virginia. Now known in many sphagnous swales and bogs from CHESTERFIELD COUNTY to GREENSVILLE COUNTY (many nos.).

SCLERIA MINOR (Britton) W. Stone. Local range extended to GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, nos. 8615, 9842.

S. SETACEA Poir. Rather general in sphagnous boggy areas inland to AMELIA COUNTY (north of Winterham, no. 9000) and DINWIDDIE and GREENSVILLE COUNTIES (several nos.).

CAREX BROMOIDES Schkuhr. Reported in 1938 only from a single station on the Coastal Plain. Rather frequent in calcareous alluvium and springy swamps of SURRY, SUSSEX and DINWIDDIE COUNTIES.

[1] Since this went to press, Mr. Alan A. Beetle has kindly called to my attention the fact that a collection from Murrell's Inlet, Georgetown County, South Carolina, *Weatherby & Griscom*, no. 16448 (as *S. divaricatus*) is good *S. fontinalis*. He also notes, as in the National Herbarium at Washington, other sheets in the covers of *S. divaricatus* but really belonging to *S. fontinalis:* one from Springfield, Alabama (*Mohr*), another from Alexandria Louisiana (without other data). Similarly misidentified, I find in the Gray Herbarium two old sheets (without full data) from Florida and a Louisiana specimen from Josiah Hale. The range of *S. fontinalis* should be indicated on MAP 15 as extending from northern Florida to Louisiana, north into Georgia and eastern South Carolina.

*C. Jamesii Schwein. Surry County: rich calcareous wooded slopes along James River, Claremont Wharf, no. 9862.

Not seen by Mackenzie (N. Am. Fl.) from Virginia, its general range southward being through West Virginia, Kentucky, Tennessee and Missouri.

C. striatula Michx. To the single Coastal Plain station (in Sussex County) recorded in 1937 add the following: Dinwiddie County: dry hickory and oak woods 2–3 miles east of Dinwiddie, no. 9871. Southampton County: dry mixed woods by Applewhite Church, no. 10,161.

*C. amphibola Steud. Surry County: rich calcareous wooded slopes along James River, Claremont Wharf, no. 9874. Dinwiddie County: rich deciduous woods about old marl-pits east of Burgess Station, no. 9873. See p. 492.

Not recorded by Mackenzie (N. Am. Fl.) from between Maryland and South Carolina.

C. gracillima Schwein.* Our only Coastal Plain station in Dinwiddie County: alluvial woods and thickets along Hatcher's Run, north of Burgess, no. 9680.

C. oxylepis Torr. & Hook. To the station in Chesterfield County recorded in 1937 add the following. Dinwiddie County: rich deciduous woods about old marl-pits east of Burgess Station, no. 9861. Sussex County: rich deciduous woods along Nottoway River, southwest of Homeville, no. 10,167. See p. 492.

*C. venusta Dew. Greensville County: sphagnous bog about 1 mile northwest of Dahlia, nos. 9880, 10,165. Southampton County: sphagnous swampy woods southwest of Applewhite Church, no. 10,166.

First from north of North Carolina. See p. 491.

C. venusta Dewey, var. minor Boeckel. (*C. oblita* Steud.). To the single station in Norfolk County, recorded in 1935, add the following. Prince George County: sphagnous boggy swale east of Gary's Church, no. 9881; seen but not collected in bog at head of Poo Run. Dinwiddie County: argillaceous and sphagnous bog ("Reams bog"), south of Burgess, no. 9879. Southampton County: wooded swamp about 7 miles south of Franklin, no. 9882. See p. 491.

C. caroliniana Schwein. Recorded in 1938 from a single station only. Now found to be common (mature in May, consequently not previously recognized in early April and mid-June) from Dinwiddie County to Surry County, south to Greensville and Southampton Counties.

C. Walteriana Bailey, var. brevis Bailey. To the two stations in Princess Anne County recorded in 1935 add the following. Sussex County: bushy swale south of Stony Creek, no. 9004. Southampton

County: wooded swamp about 7 miles south of Franklin, no. 9884. See p. 490.

*C. verrucosa Muhl. Southampton County: swampy woods southwest of Branchville, no. 9286.

Not recorded by Mackenzie (N. Am. Fl.) from north of South Carolina.

*C. hyalinopsis Steud. (*C. riparia*, var. *impressa* S. H. Wright). Surry County: sandy tidal shore of Crouch Creek, east of Scotland, no. 8620.

Not seen by Mackenzie (N. Am. Fl.) from between North Carolina and southern New Jersey. See p. 467.

*C. lupuliformis Sartw. York County: swampy woods east of Tabb's, no. 8623.

First from south of Delaware.

*Xyris platylepis Chapm. To the doubtful report from Charles City County by Mrs. Erlanson add the following, without doubt. Henrico County: sphagnous springy swales and boggy thickets bordering Whiteoak Swamp, west of Elko Station, nos. 9007, 9008. Nansemond County: seeping bank of ditch at margin of woods, about 2 miles southeast of Cleopus, no. 9009. Greensville County: wooded swamp along Mill Creek, about 1 mile north of Skipper's, no. 8636; sphagnous bog about 1 mile northwest of Dahlia, nos. 8637, 9551.

Very characteristic in its large bulbous bases covered by short castaneous scales and in its broad spiraling leaves. See pp. 470, 473.

X. Curtissii Malme. To the first Virginian station (first station recorded from north of Georgia), recorded in 1937 in Sussex County, add the following. Dinwiddie County: argillaceous and sphagnous bog ("Reams bog"), south of Burgess, no. 9011. Greensville County: sphagnous bog about 1 mile northwest of Dahlia, no. 8635. See pp. 470, 473.

X. flexuosa Muhl. (*X. arenicola* Small). To the first Virginian station (pine barrens, Isle of Wight County), recorded in 1937, add the following. Dinwiddie County: argillaceous and sphagnous bog ("Reams bog"), south of Burgess, no. 9010. Greensville County: sphagnous bog about 1 mile northwest of Dahlia, no. 8638. Nansemond County: sandy and peaty pine barrens east of Cox Landing, south of South Quay, no. 10,566, very abundant. See p. 472.

*Juncus secundus Beauv. Sussex County: new roadside gravel near Nottoway River, southeast of Homeville, no. 10,184. Greensville County: fallow argillaceous field and exsiccated pond-hole, north of Skipper's, no. 9888. See p. 490.

J. caesariensis Coville (*J. asper* Engelm.). To the Virginian station (in James City County) of Grimes add the following in

HENRICO COUNTY: open wet sandy and peaty *Magnolia* thicket in Whiteoak Swamp, east of Elko Station, no. 8650; sphagnous springy swales bordering Whiteoak Swamp, west of Elko Station, nos. 9016, 9292.

A very extensive colony 25 miles northwest of Grimes's station. See pp. 470, 473.

HELONIAS BULLATA L. HENRICO COUNTY: bushy sphagnous springy swales bordering Whiteoak Swamp, west of Elko Station, no. 9295.

Our first Coastal Plain station in Virginia, the plant associated with *Parnassia asarifolia*, *Juncus caesariensis* and other species far-isolated from their better known centers of occurrence. See p. 478.

CHAMAELIRIUM LUTEUM (L.) Gray. GREENSVILLE COUNTY: dry pine and oak woods and thickets near Three Creek, north of Emporia, very local, no. 9296. SOUTHAMPTON COUNTY: rich mixed and deciduous woods near Nottoway River, above Carey Bridge, no. 10,198. SUSSEX COUNTY: badly broken and eaten specimens once seen (in 1936) at border of woods east of Homeville.

Certainly very local on the Virginian Coastal Plain. See p. 485.

AMIANTHIUM MUSCAETOXICUM (Walt.) Gray. SOUTHAMPTON COUNTY: border of wooded swamp about 7 miles south of Franklin, nos. 9892, 10,199. NANSEMOND COUNTY: sphagnous savannah-like swale east of Cherry Grove, south of South Quay, no. 10,578, abundant.

Very definite stations on the Virginian Coastal Plain. In RHODORA, xxxix. 364 and 399 (1937), I recorded a station south of Factory Hill in Nansemond County. Retravel of the road shows that the latter station is a few rods over the state line in Gates County, North Carolina! See p. 490.

*ZIGADENUS ANGUSTIFOLIUS (Michx.) Wats. (*Tracyanthus angustifolius* (Michx.) Small.). GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, nos. 6565, 9891, only a few plants.

Extension north from North Carolina. See pp. 470, 491 and MAP 6.

Z. GLABERRIMUS Michx. Range extended inland to DINWIDDIE COUNTY: argillaceous and sphagnous bog ("Reams bog"), south of Burgess, no. 9026; seen in some abundance some miles northwest of Burgess.

UVULARIA **pudica** (Walt.) comb. nov. *Anonymos pudica* Walt., Fl. Carol. 123 (1788). *U. puberula* Michx. Fl. Bor.-Am. i. 199 (1803).

U. PUDICA (Walt.) Fern., var. **nitida** (Britton), comb. nov. *Oakesia sessilifolia*, var. (?) *nitida* Britton in Trans. N. Y. Acad. Sci. ix. 13 (1889). *U. sessilifolia nitida* (Britton) Morong in Mem. Torr. Bot. Cl. v. 111 (1894). *U. nitida* (Britton) Mackenzie in Torreya, viii. 14

(1908). *U. puberula*, var. *nitida* (Britton) Fernald in RHODORA, xxxvii. 407, t. 392, figs. 2, 3 and 6 (1935).

Walter's unnamed but clearly defined genus *Anonymos*,[1] *Erythronio affinis* in his Fl. Carol. 122 (1788), had in five paragraphs a good diagnosis. His generic characters, with "*capsula* turbinato-triangularis . . . Sem. *bina* in singulo loculamento depresso-globosa, ab uno latere cincta membrana vesiculari" is closely similar to Michaux's characterization of *Uvularia*, with "Cap. . . . trigona, angulis compressis . . . Sem. . . . abortatione solito paucissima; irregulariter subglobosa; ad hilum arilata," and the single species, *Anonymos pudica*, was clearly described:

> *pudic.* 1. radice fibrosa, caule pedali, foliis amplexicaulibus alternatis ovatis, floribus terminalibus, flavescentibus, plerumque solitariis, cernuis.

Examining Walter's herbarium in 1839, Asa Gray recorded: "*Anonymos* (*Erythronio* aff.) *pudica!* = *Uvularia puberula!* Leaves with a long slender acumination [such as is frequently accentuated in pressed specimens through puckering of the upper half of the leaf], flowers & fruit none: two slender terminal peduncles." The original description of *Uvularia puberula* Michx. was very brief, but it stressed the plant "foliis . . . ovalibus, basi rotundatis, subamplexicaulibus". There is no reason to doubt Gray's identification; there is every reason to accept it. *U. pudica* (*U. puberula*) is frequent on the coastal plain of Virginia and the Carolinas and I have before me very characteristic material from Santee Canal. Walter's Flora was written "ad Ripas Fluvii Santee".

In southeastern Virginia U. PUDICA (typical) is occasional in woods from eastern Nansemond County westward, passing to

*Var. NITIDA (Britton) Fern. supra. SOUTHAMPTON COUNTY: dry sandy open pine and oak woods and thickets 6 to 7 miles south of

[1] I realize that Walter's beautifully described new genera, which, in his modesty, he hesitated to name and called *Anonymos*, are subject to ridicule by some of the younger English botanists; but, as repeatedly pointed out, as for instance by Blake in RHODORA, xvii. 130 (1915), the species under these nameless but clearly defined genera are perfectly valid *as species*. The fact that Blake in 1915 did not find some types of Walter's which were studied by Gray in 1839 is significant. In his manuscript of a full century ago Gray noted under *Clematis holosericea*, which Pursh described from a specimen said to be in "*Herb. Walter*": "There is nothing in Walter's herb. to correspond to this . . . Pursh must have carried off the specimen, or part of it." Then follows in another ink: "P. S. He has taken it all to herb. Lambert—which see." Pursh and his patron, Lambert, were not the only early botanists who felt that Walter's plants would be of better service elsewhere (for instance, see note on *Lobelia glandulosa* by Fernald & Griscom, RHODORA, xxxix. 497).

Franklin, no. 9895. NANSEMOND COUNTY: sandy and peaty pine barrens east of Cox Landing, south of South Quay, no. 10,580.

First from south of New Jersey.

*HEMEROCALLIS FULVA L., var. KWANSO Regel. SOUTHAMPTON COUNTY: well established by roadside near Oak Grove School, no. 8202.

Single-flowered *Hemerocallis fulva* is one of the abundant roadside plants; we have not before found var. *Kwanso* established as a wild plant.

LILIUM CAROLINIANUM Michx. GREENSVILLE COUNTY: open thickets, clearings and borders of woods southeast of Emporia, no. 9298, scarce; clearing at border of dry pine and oak woods, south of Skipper's, in some abundance, no. 9557. SUSSEX COUNTY: border of dry mixed woods east of Grizzard, very scarce, no. 10,202; border of dry woods northwest of Jarratt, no. 11,005. PRINCE GEORGE COUNTY: border of dry pine and oak woods 3–5 miles north of Disputanta, no. 11,004.

Characteristic of high altitudes in the Blue Ridge and the Alleghenies. See p. 485 and MAP 13.

ALETRIS AUREA Walt. To the few recorded Virginian stations add the following. GREENSVILLE COUNTY: peaty openings bordering wooded swamp along Mill Creek, about 1 mile north of Skipper's, no. 8669; sphagnous bog about 1 mile northwest of Dahlia, no. 8670 (racemes up to 3 dm. long). BRUNSWICK COUNTY: argillaceous swale about 5 miles east of Edgerton, no. 8671. See p. 472.

*DIOSCOREA BATATAS Dcne. SURRY COUNTY: established along roadside, Spring Grove, no. 9559.

BURMANNIA BIFLORA L. GREENSVILLE COUNTY: peaty openings bordering wooded swamp along Mill Creek, about 1 mile north of Skipper's, no. 9561; sphagnous bog about 1 mile northwest of Dahlia, nos. 8676, 9035, 9303. SOUTHAMPTON COUNTY: mossy pineland southeast of Sands, no. 9560.

With the exception of a collection (locality not noted) by Nuttall (Herb. Phil. Acad.) *Burmannia biflora* has apparently been unknown in Virginia since the type was collected more than two centuries ago by Clayton. Britton (*Man.*) gives the flowering period as "Sept.–Nov." In the bog near Dahlia we had unexcelled opportunity to observe the plant, which there makes an interrupted porcelain-blue film beneath half-an-acre of *Lachnocaulon anceps, Panicum strigosum* and other characteristic sphagnophilous plants. The first flowers were collected on July 15; on August 20 the plant was generally in flower; and on September 18 it was mature, the taller fruiting plants

1.7 dm. high, with forking inflorescences up to 3.2 cm. long. On October 14 it seemed not to have changed, though on that date it was just flowering north of Skippers. On December 31 the bog had become severely frosted and *Burmannia* was dry and scarcely recognizable. See pp. 472, 485, 488, 491 and MAP 7.

SPIRANTHES OVALIS Lindl. To the stations already recorded (in Henrico, Sussex and Southampton Counties) add one in DINWIDDIE COUNTY: rich woods about an old marl-pit, about 2 miles east of Burgess Station, no. 9563. See pp. 486, 492.

PONTHIEVA RACEMOSA (Walt.) Mohr. Add another very extensive station in SURRY COUNTY: rich deciduous woods 1½ miles east of Blizzard's Corners, no. 9305. See p. 477.

CORALLORRHIZA WISTERIANA Conrad. SURRY COUNTY: rich deciduous woods, ravine northwest of Bacon's Castle, no. 9707.

The statement on p. 489, that our station for *Corallorrhiza Wisteriana* is the first in Virginia, is incorrect. Dr. Wherry very kindly writes me of stations in the uplands of the state, in Fairfax and London Counties.

MALAXIS BAYARDI Fern. To the original station (in Nansemond County) add another on the Coastal Plain. GREENSVILLE COUNTY: dry pine and oak woods, about 1 mile north of Skipper's, no. 8906, very scarce. See p. 469.

In neighboring woodlands all the plants seen were of the relatively frequent *Malaxis uniflora* Michx.

APLECTRUM HYEMALE (Muhl.) Torr. To the Coastal Plain stations (in Surry County) already noted add others in PRINCE GEORGE and DINWIDDIE COUNTIES: all in highly calcareous areas. See pp. 486, 489.

SALIX LONGIPES Shuttlew., var. VENULOSA (Anderss.) Schneider. To the stations recorded in Norfolk County (in 1937) add the following. NANSEMOND COUNTY: border of damp woods, South Quay, no. 9567. GREENSVILLE COUNTY: shallow pond-hole in woods, just north of Dahlia, no. 8691 (large trees, the foliage with balsamic odor); pond-hole in pine and oak woods near Three Creek, north of Emporia, no. 9309 (large trees).

The slenderest-leaved extreme, closely matching the narrowest-leaved twigs of *Curtiss*, no. 5826, from Jacksonville, Florida, identified by Schneider.

CASTANEA NEGLECTA Dode. NANSEMOND COUNTY: sandy woods by Blackwater River, George's Bend, south of South Quay, no. 10,613. SURRY COUNTY: rich deciduous woods 1½ miles east of Blizzard's Corners, no. 9312. DINWIDDIE COUNTY: border of dry sandy woods east of Burgess, no. 10,232. SOUTHAMPTON COUNTY: mixed woods near Nottoway River, above Carey's Bridge, no. 10,612.

Although often called a hybrid of *Castanea dentata* and *C. pumila*, the shrubs east of Burgess are several miles from the nearest trees of *C. dentata* which used to be known to our driver and assistant, Leonard Birdsall, on whose land *C. neglecta* occurs. At the Surry County station both *C. dentata* and *C. pumila* were in the vicinity; but the shrubs in Nansemond seem to be removed by very many miles from the eastern limit in the state of *C. dentata*. *C. neglecta* appears to be a definite species.

Quercus cinerea Michx. Range extended northwestward in Southampton County: dry white sand in oak and pine woods and clearings bordering Assamoosick Swamp, south of Sebrell, no. 9911. Found in Nansemond County: sandy pine barrens east of Cherry Grove, south of South Quay, no. 10,619.

Polygonum tenue Michx. To the station already reported, in Isle of Wight County, add one in Caroline County: border of sandy woods of *Pinus virginiana*, about 1½ miles northwest of Bowling Green, no. 9041.

P. lapathifolium L. Chesterfield County: dominant on silt of Appomattox River, Pocahontas, no. 9318.

The only time seen by us in eastern Virginia.

*P. pensylvanicum L., var. durum Stanford in Rhodora, xxvii. 180 (1925). Isle of Wight County: weed in cultivated field, north of Walters, no. 8705. Greensville County: border of cultivated field, about 1 mile northwest of Dahlia, no. 8704.

Extension north from South Carolina; presumably generally distributed in southeastern Virginia. Quickly distinguished by the nearly or quite glandless appressed-strigose stiff peduncles. See p. 469.

P. robustius (Small) Fernald. Prince George County: muddy tidal shore of James River, Jordan Point, no. 9043.

The glandular dots which appear on the perianth when dry are largely if not wholly post-mortem.

Acnida cannabina L. Extending up the James at least to Prince George County.

*Mirabilis Jalapa L. York County: abundant about a dump, in the woods southeast of Yorktown, no. 8706.

*Stellaria prostrata Baldw. (*Alsine Baldwinii* Small.). Greensville County: forming close yellowish-green mats in lawns and grass-lands, Emporia, no. 9722. Southampton County: similar habitat, Courtland, no. 9723; also seen in Franklin.

Range extended northward from Georgia. In its closely depressed yellow-green mats and promptly disarticulating mature small calices and capsules *Stellaria prostrata* is very distinct. In southeastern

Virginia it is becoming a very objectionable weed of lawns, completely monopolizing the ground, maturing in late March and early April and by May leaving naked areas. See p. 489.

*Cerastium brachypodum (Engelm.) Robinson. Dinwiddie County: plowed land at border of rich woods, Cattail Creek, south of Burgess, no. 9718.

First north of Georgia. A characteristic species of the Gulf Coastal Plain and Mississippi Basin, thence west to Arizona and east to Georgia. At Cattail Creek apparently native, though intruded upon and stimulated by plowing of the area. Not found away from the border of the woods nor showing a tendency to spread into the cultivated field. See p. 489.

*C. brachypetalum Desp. Southampton County: open sandy roadside 6–7 miles south of Franklin, no. 9922.

A very distinct European species, the bracteal leaves ending in tufts of trichomes. The first record from North America. See p. 490.

*C. vulgatum L., var. holosteoides Fries. Southampton County: roadsides and waste places, Courtland, no. 9921.

New to North America. A very striking plant, with only minutely hirtellous stems and nearly glabrous blue-green obtuse leaves. See p. 490.

Ranunculus laxicaulis (T. & G.) Darby. *R. oblongifolius* of authors generally, not Ell.

The very slender plant of the South, which regularly passes as *Ranunculus oblongifolius*, has filiform loosely sprawling stems, these weak stems and the diffuse panicle soon proliferating and developing flabelliform leafy divergent offshoots and wide-spreading repent stolons; its oblong petals conspicuously exceed the sepals, and the subglobose achenes have a subulate (soon deciduous) style.

When Elliott (Sk. ii. 58) described his *Ranunculus oblongifolius* he doubted its distinctness from *R. pusillus* Pursh. His diagnosis and comment were as follows:

> *Root* fibrous. *Stem* 1–2 feet high, generally erect or declining, glabrous, smooth, branching and from the smallness of the upper leaves appearing naked towards the summit. *Leaves* oblong, irregularly denticulated, glabrous, the lower on petioles 1–3 inches long. *Peduncles* 10–15 lines long. *Calyx* at first closely appressed. *Petals* rather longer than the calyx. *Seeds* smooth without a vestige of the style, globose, with a slight longitudinal cicatrice.
>
> This species which I propose with hesitation, differs from the preceding [*R. pusillus*] much in size, and appears to differ in the corolla and seed. It requires however, to be further examined.

Grows in ditches and wet places. Collected 12 miles from Savannah on the Augusta road. St. John's Berkley. Dr. Macbride.
Flowers May–July.

The diagnosis suggests *Ranunculus pusillus* rather than the very lax plant with few loosely paniculate long-stalked and relatively large flowers which regularly passes as *R. oblongifolius*. It was, therefore, not wholly surprising, when Mr. Long and I studied Elliott's material at Charleston in early April, to find that the type of *R. oblongifolius* is characteristic large material of *R. pusillus* Pursh.

For *R. oblongifolius* of authors the best name is apparently *R. laxicaulis* (T. & G.) Darby (1855). No one who is familiar with so-called *R. oblongifolius* would balk at the propriety of the name *laxicaulis;* it is most fitting. *R. laxicaulis* started as *R. Flammula,*

β. *laxicaulis:* stem weak, much branched; leaves all entire; lowest ones elliptical-oblong, upper ones linear; petals oblong, attenuate at the base, three times as long as the calyx . . .
β. Milledgeville, Georgia. *Dr. Boykin.* July.— . . . Peduncles 1–2 inches long. Flowers 4–5 lines in diameter.—T. & G. Fl. i. 16 (1838).

Darby's fuller account was as follows:

R. LAXICAÚLIS, (T. & G.) *Stem* weak, much branched, declined, rooting at the lower joints, glabrous. *Leaves* smooth, linear-lanceolate, or elliptical, oblong; upper ones linear. *Peduncles* opposite the leaves, 1–2 inches long. *Carpels* with a subulate beak in a globular head. *Petals* much longer than the calyx, slender at the base.— ♄ . Ditches, Car. and Geo. July.—Darby, Bot. So. States, 204 (1855).

Both the original Torrey & Gray account of Boykin's plant and the fuller account by Darby are perfect descriptions of the plant erroneously passing as *R. oblongifolius*. This I intimated in 1936 (RHODORA, xxxviii. 175), when I showed that the name *R. laxicaulis* certainly does not belong to *R. ambigens* Wats. Although, as then stated, the type can not be found, the descriptions are so convincing to one who has followed through the surrounding vegetation the "weak, much branched, declined" stems, "rooting at the lower joints," that I now have no hesitation in taking up for *R. oblongifolius* of authors, not Ell. the appropriate name R. LAXICAULIS (T. & G.) Darby.

In Virginia RANUNCULUS LAXICAULIS is local in HENRICO, ISLE OF WIGHT, SUSSEX and SOUTHAMPTON COUNTIES (many nos.).

R. MICRANTHUS Nutt. PRINCE GEORGE COUNTY: base of calcareous wooded slope, City Point, no. 9724; rich wooded ravine southeast of Hopewell, no. 9725; rich deciduous woods, Coggins Point, no. 9927.
See p. 488.

The plant of rich calcareous woods in eastern Virginia is strikingly unlike that of thin rocky soils in New England, New York, northern New Jersey and Pennsylvania, being of a dark green color, with lustrous leaf-surfaces, the simple basal leaves usually subcordate to strongly cordate; whereas the northern plant of thin soils is paler green, with opaque foliage, the simple basal blades merely subtruncate to cuneate at base. The plant with lustrous leaves is coarser and the teeth of its basal leaves are broadly flattened or squared across the top but the teeth of the simple basal leaves of the smaller opaque and pale-green northern plant are more prolonged and short-ovate or dentate.

Nuttall described *Ranunculus micranthus* from Arkansas. The type, preserved in the Gray Herbarium, is like the plant of Prince George County. The smaller plant with more truncate-based and crenate-dentate simple basal leaves is

R. MICRANTHUS Nutt., var. **delitescens** (Greene), comb. nov. *R. delitescens* Greene in Am. Midl. Nat. iii. 333 (1914).

Another variety, from Indiana, with deeply cordate simple basal leaves but with the teeth much prolonged, is

R. MICRANTHUS Nutt., var. **cymbalistes** (Greene), comb. nov. *R. cymbalistes* Greene, l. c. (1914).

R. CAROLINIANUS DC. *R. palmatus* of recent Am. auth., not Ell.

One of the most definite species of the southeastern Coastal Plain is the slender and finally strongly repent plant which passes as *Ranunculus palmatus*. Separated from its allies (*R. septentrionalis* Poir. and *R. hispidus* Michx.) by its short (3.5–5 mm. long) and promptly reflexed glabrous sepals, its relatively short and narrow oblong petals, and by the few very large mature achenes (with bodies 3.7–5 mm. long), with the broad (0.5–1 mm.) marginal wing separated from the faces by high acute ridges, the species is further distinguished from the other tardily repent species, *R. septentrionalis*, by its very slender habit and small smoothish leaves, and heads with only 10–20 achenes. In the southern so-called *R. palmatus* the best-developed basal leaves have 3 mostly petiolulate rhombic-ovate, cuneate 3-cleft or 3-divided and sharply toothed leaflets.

In view of the very definite characters of this southern Coastal Plain type, it is, therefore, important to note of Elliott's account (Sk. ii. 61, with important notes on p. 62) that his *R. palmatus*, published with a mark of doubt, was hairy, the leaves "those of the root

palmately 3 parted" and that (on p. 62) he specifically stated that "in the R. palmatus, the leaves as far as I have seen them, are never divided to the base, and are very hairy". In other words Elliott's description calls for something quite different from *R. palmatus* sensu American authors (not Elliott). It was, consequently, reassuring, when Mr. Long and I studied Elliott's type at Charleston, to find that it is one of the states of *R. hispidus* Michx. with appressed pubescence. There are abundant achenes and these are of *R. hispidus*.

The plant nowadays incorrectly called *R. palmatus* is *R. carolinianus* DC. Syst. i. 292 (1817), with "foliis glabriusculis trisectis trilobisve, lobis ovatis subincisis dentatis, calyce glabriusculo reflexo petalis paulò breviore," from "Carolina inferiore". Elliott copied DeCandolle's description of approximately the same date but he did not know the plant, merely noting:

> Radical leaves trisected or three lobed, segments and lobes ovate, obtuse, and obtusely toothed. DeCand.
> This plant appears to resemble the preceeding species [*R. palmatus*], but in the R. palmatus, the leaves as far as I have seen them, are never divided to the base, and are very hairy.

The basal leaves, the smooth and reflexed sepals and the "petalis potiùs oblongis quàm obovatis" of DeCandolle's account of *Ranunculus carolinianus* are conclusive. Furthermore, Asa Gray, examining the type at Geneva, made the memorandum: "I have no form so slender and few- and large-fruited as the *R. Carolinianus* DC. *R. palmatus* Ell. in Hb. Torr. from Chapman.—Feb., 1886." No material of this southern species was in the Gray Herbarium during Gray's lifetime. *R. palmatus* sensu auth., not Ell. becomes, then, R. CAROLINIANUS DC.

In Virginia RANUNCULUS CAROLINIANUS is found in low woods, on wet bottomlands and by streams in GLOUCESTER, NORFOLK, PRINCE GEORGE and SOUTHAMPTON COUNTIES (many nos.).

RANUNCULUS SARDOUS Crantz. The small station previously reported doubtless had its origin from a very extensive one in SOUTHAMPTON COUNTY: very abundant weed, not eaten by cattle, in pastures, on roadsides and in fields about Franklin, no. 9933.

Destined to become a pernicious weed unless vigorous measures for several years are taken to eradicate it.

ANEMONELLA THALICTROIDES (L.) Spach. Range extended eastward to SURRY COUNTY: rich calcareous woods, ravine 1½ miles north of Surry, no. 9727.

THALICTRUM REVOLUTUM DC. To the stations along the James add

the following. DINWIDDIE COUNTY: rich deciduous woods about old marl-pits east of Burgess Station, no. 9934. SUSSEX COUNTY: dry woods bordering Assamoosick Swamp, about 2 miles northeast of Homeville, no. 10,263.

T. MACROSTYLUM (Shuttlew.) Small & Heller. HENRICO COUNTY: sphagnous springy swales bordering Whiteoak Swamp, west of Elko Station, nos. 8710, 8711, 9050. JAMES CITY COUNTY: wooded flood-plain, Longhill, *Grimes*, no. 4086 (as *T. polygamum*). See p. 470.

Chiefly a plant of the upland.

CLEMATIS PANICULATA Thunb. Abundantly naturalized in damp thickets and swamps and on shores, PRINCE GEORGE, GREENSVILLE and ISLE OF WIGHT COUNTIES (many nos.).

*C. PANICULATA, var. DIOSCOREAEFOLIA (Lév. & Vaniot) Rehder. PRINCE GEORGE COUNTY: abundant along the James from City Point to Jordan Point, nos. 8714, 9052.

*BERBERIS THUNBERGII DC. CHESTERFIELD COUNTY: abundantly naturalized, alluvial woods and clearings, Pocahontas, no. 9324.

CARDAMINE DOUGLASSII (Torr.) Britton. PRINCE GEORGE COUNTY: rich bottomland woods along Wall's Creek, no. 9736. SURRY COUNTY: bottomland woods, calcareous ravine, 1½ miles north of Surry, nos. 9737 (petals deep purple), 9738 (petals paler). See p. 489.

*C. PENSYLVANICA Muhl., var. BRITTONIANA Farwell. Characteristic of wooded springheads and wooded brooksides, especially in calcareous areas. PRINCE GEORGE COUNTY: alluvial woods by Wall's Run, northwest of Garysville, no. 9937. SURRY COUNTY: springhead, bottomland woods in calcareous ravine 1½ miles north of Surry, no. 9739. NORFOLK COUNTY: border of gum swamp west of Cedar Hill, *Fernald & Griscom*, no. 4420. PRINCESS ANNE COUNTY: wooded (gum) swamp, Oceana, *Fernald & Griscom*, no. 4419.

*CAPSELLA RUBELLA Reut. Frequent or common in waste places and on roadsides (several nos.).

× SARRACENIA CATESBAEI Ell. GREENSVILLE COUNTY: with the two parents, sphagnous bog about 1 mile northwest of Dahlia. no. 8716. See p. 472.

DROSERA BREVIFOLIA Pursh. To the three records (from Nansemond, Elizabeth City and Greensville Counties) already noted add the following. DINWIDDIE COUNTY: argillaceous and sphagnous bog ("Reams bog"), south of Burgess, no. 9574; wet argillaceous and siliceous depressions north of Burgess Station, no. 9939. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond) about 4 miles northwest of Homeville, no. 9940; peaty and argillaceous swale north of Littleton, no. 9941. NANSEMOND COUNTY: seeping bank of ditch at margin of woods, about 2 miles southeast of Cleopus, no. 9573.

Drosera brevifolia is probably rather common in the area but usually overlooked. Its flowering season is very limited, in May (possibly

early June); and the large (1–1.4 cm. broad) white flowers close promptly at noon. Through the hot summer the shrivelled plants are very inconspicuous but in October the new deep-red rosettes appear in profusion. See p. 487.

Saxifraga virginiensis Michx. Local range extended well into the Coastal Plain in Surry County: rich wooded ravine northwest of Bacon's Castle.

Deutzia scabra Thunb. Surry County: roadside thicket, Claremont Wharf, no. 9942.

Pyrus serotina Rehder. Rather frequent at borders of woods in Dinwiddie, Surry and Southampton Counties (several nos.).

Rubus phoenicolasius Maxim. Chesterfield County: thickets, Pocahontas, no. 9335.

Potentilla recta L. Railroad banks and waste places, becoming frequent, Dinwiddie County to Greensville County (several nos.).

Aeschynomene virginica (L.) BSP. Prince George County: border of rich alluvial thicket back of sand-beach of James River, Jordan Point, no. 9343. Surry County: sandy beach of James River, at mouth of Crouch Creek, east of Scotland, nos. 8724, 9344, 9580. James City County: tidal shore, Back River, opposite Jamestown Island, no. 11,052. Charles City County: sandy tidal shore of Chickahominy River, Ferry Point, no. 11,053.

Reinstatement of an interesting plant to the flora of the state. Apparently not previously known in Virginia since the collection of the type by Clayton. See pp. 466 and 475 and map 1, also Rhodora, xxxix. 473 (1937).

*Desmodium ochroleucum M. A. Curtis. Caroline County: border of sandy woods of *Pinus virginiana*, about 1½ miles northwest of Bowling Green, no. 9066. Sussex County: dry sandy hickory and oak woods, Burt, no. 6237.

One of the very rare species of the genus, thoroughly distinct in its creamy petals, changing to yellowish, and in its twisted and not always clearly articulated segments. See p. 474.

D. rhombifolium (Ell.) DC. To the records from Norfolk and Isle of Wight Counties add the following from Southampton County: border of dry sandy woods, Mars Hill Church, no. 9067; dry sandy open pine and oak woods 6 to 7 miles south of Franklin, no. 8728.

Lathyrus hirsutus L. Recorded in Rhodora, xxxix. 433 (1937) as new to Virginia. Now rather common in Henrico, Dinwiddie, Prince George and Surry Counties (many nos.).

*Apios americana Medikus, var. **turrigera**, var. nov. (tab. 575, fig. 1 et 2), racemis laxis lanceolato- vel ovoideo-attenuatis, apice prolongatis.—Southeastern and central United States, apparently local. The following specimens are before me. Virginia: rich alluvial

woods and thickets back of sand-beach of James River, below Sunken Meadow Beach, Surry County, August 23, 1938, *Fernald & Long*, no. 9079 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.). SOUTH CAROLINA: rich thicket, North Charleston, July 15, 1927, *Wiegand & Manning*, no. 1632; river-swamp east of Hendersonville, July 20, 1927, *Wiegand & Manning*, no. 1633. MISSISSIPPI: Ocean Springs, 1895, *J. Skehan*. LOUISIANA: old specimen ex herb. Torrey. ILLINOIS: Mt. Carmel, August 6, 1887, *M. B. Waite;* damp thicket, Calamas Lake, Macon County, July 22, 1915, *Clokey*. KANSAS: sandy woods, Pottawatomie County, July 23, 1895, *J. B. Norton*, no. 117. OKLAHOMA: Cherokee Nation, August 19, 1895, *J. W. Blankinship*.

Typical *Apios americana* has the compact and thick raceme strongly rounded at summit (FIG. 3). When mature, with flowers or fruits dropped, the rachis is 3–17 cm. long. In var. *turrigera* the denuded mature rachis is usually 1–2 dm. long. The plants of the latter variety, as well as those of forma *pilosa* Steyermark (1938), will be found in the herbaria under the synonymous names, *Glycine Apios* L. (1753), revived by Britton (1913); *Apios americana* Medikus (1787), revived by Rehder (1934); *A. tuberosa* Moench (1794) and *Apios Apios* (L.) Macmillan (1892). Had those who have devoted much time to juggling the names looked at the material they might have discovered that their names covered at least three different entities! See p. 475.

IN PLATE 575, FIG. 1 shows an inflorescence, × 1, of *Apios americana*, var. *turrigera* from the TYPE, Sunken Meadow Beach, Virginia, *Fernald & Long*, no. 9079; FIG. 2, inflorescences, × 1, from east of Hendersonville, South Carolina, *Wiegand & Manning*, no. 1633. FIG. 3 is a characteristic inflorescence, × 1, of typical *A. americana*, from Fishers Island, New York, *St. John*, no. 2761.

PTELEA TRIFOLIATA L. Extending down the James well into the Coastal Plain. PRINCE GEORGE COUNTY: rich alluvial woods and thickets by James River, Upper Brandon, no. 9356. SURRY COUNTY: rich alluvial woods and thickets back of sand-beach of James River, Eastover, no. 8746. See p. 466.

*PONCIRUS TRIFOLIATA (L.) Raf. SURRY COUNTY: a single shrub 1 m. high at border of woods, west of Claremont, no. 9085.

It was surprising to find the Trifoliate Orange, so much employed as a fiercely spiny hedge-shrub farther south, hardy and in open woods of Surry County.

CROTONOPSIS ELLIPTICA Willd. CHESTERFIELD COUNTY: exsiccated sandy woodroad 1½ miles northwest of Ettrick, no. 9358. AMELIA COUNTY: border of argillaceous bog about 1 mile north of Winterham, no. 9090. See p. 474.

Certainly very local. The only Virginian material previously in the Gray Herbarium is from Fairfax County.

*Euphorbia ammanioides HBK. York County: sandy beach, York River, northwest of Yorktown, no. 7510 (distributed as *E. polygonifolia*).

Dr. Louis C. Wheeler calls my attention to this material, collected after dark and mistaken for the common sand-beach *Euphorbia polygonifolia*. It is *Chamaesyce Ingallsii* Small of "sand-dunes, Fla. to Tex."

*E. falcata L. Henrico County: railroad siding west of Elko Station, no. 9093. Previously collected (distributed without identification) in Bath County: along railroad, locally abundant, vicinity of Millsboro, September 17, 1907, *E. S. Steele.*

Both stations are on the Chesapeake and Ohio Railroad. This characteristic European species may be confidently looked for across the state, near this trunk line. See p. 473.

*Callitriche deflexa A. Br., var. Austini (Engelm.) Hegelm. (*C. Austini* Engelm.). Norfolk County: damp road in pine woods east of North Landing, May 6, 1935, *Fernald & Griscom*, no. 4447. Greensville County: fallow argillaceous field and exsiccated pond-hole, north of Skipper's, no. 9968. See p. 490.

Acer Negundo L. Extending down the James to Charles City County: alluvial woods along James River, Harrison Point, no. 9097.

*Parthenocissus quinquefolia (L.) Planch., forma hirsuta (Donn) Fernald in Rhodora, xli. 429 (1939). Prince George County: alluvial woods by Wall's Run, northwest of Garysville, no. 9979.

Vitis vulpina L. (*V. cordifolia* Michx.). See Rhodora, xli. 431 (1939). Rather frequent in rich or alluvial thickets eastward to Surry and Southampton Counties also on the shores of Back Bay in Princess Anne County (many nos.).

V. rotundifolia Michx.

On the wooded alluvial bottomland of Meherrin River, near Haley's Bridge, an area which had been deeply submerged during much of the summer of 1938, long pendulous and branching cord-like roots hung in September and October from trunks and branches 3 m. above the ground. These tough pendulous roots, up to 2.25 m. long, gave the aspect of festoons of *Tillandsia usneoides*.

*Sida rhombifolia L. Southampton County: roadsides and waste places, Courtland, nos. 8765 and 9098.

Extension north from North Carolina. See p. 469.

Photo. W. H. Hodge

OENOTHERA FRUTICOSA, var. MICROCARPA: FIG. 1, summit of TYPE, × 1; FIG. 2, capsule, × 5.

Var. SUBGLOBOSA: FIG. 3, capsule, × 5, from Georgia.

Photo. W. H. Hodge

Oenothera fruticosa, var. unguiculata: fig. 1, type, × 2/5; fig. 2, bud, × 3, from type; fig. 3, capsule, × 5, from topotype.
Var. vera: bud, × 3, from New Jersey.

*Althaea officinalis L. Mathews County: border of brackish marsh near North, no. 8764, a large and thoroughly established colony.

First from south of Long Island. See p. 468.

Hypericum mutilum L., var. **parviflorum** (Willd.), comb. nov. *H. parviflorum* Willd. Sp. Pl. iii[2]. 1456 (1803). Less common in southeastern Virginia than typical *H. mutilum*.

The type of *Hypericum mutilum* L., a Clayton plant, is the common southern extreme with the uppermost cauline and the rameal leaves ovate- to lance-deltoid, or gradually tapering from base to blunt summit. Var. *parviflorum* is the wider-ranging and usually more northern plant with all the leaves elliptic and gradually rounded at summit, described by Willdenow "Folia *elliptica obtusa sessilia basi subcordata*". In the South both extremes occur and northward to southern New England, central New York, Ohio, Illinois and Missouri there are some transitions. In northern New England, northern New York, Nova Scotia, New Brunswick, Quebec and the region westward only var. *parviflorum* seems to occur. Typical *H. mutilum* is often very tall, plants 7.5–9 dm. high being not infrequent. Var. *parviflorum* is usually lower and more delicate, though plants 6–7 dm. high occur.

H. Drummondii (Grev. & Hook.) T. & G. Greensville County: disturbed soil of roadside bank, bordering clearing in pine and oak woods near Three Creek, north of Emporia, no. 9378; roadside bordering open thickets and borders of woods southeast of Emporia, no. 9379.

Primarily a species of the interior of the country and of the Gulf States, though occurring locally from Florida to southeastern Virginia. See p. 485.

Lechea racemulosa Michx.—In view of the scarcity of expanded flowers in the genus, it should be recorded that *Lechea racemulosa* was twice found in full anthesis at 10 *A. M.*, the large colonies being uniform in the great profusion of widely expanded flowers, seemingly all on the plant fully open at once! This was in July. In August of 1936, with Mr. Griscom we found *L. minor* thus fully flowering, also at about 10 *A. M.* Perhaps those who have sought the expanded flowers have looked too early in the day.

Viola Stoneana House. To the few recorded stations add one from Greensville County: rich deciduous woods by Metcalf Branch, east of Emporia, no. 9102.

V. lanceolata L., var. vittata (Greene) Weath. & Grisc. To the

recorded stations (in Sussex and Isle of Wight) add one in GREENSVILLE COUNTY: fallow argillaceous field and exsiccated pond-hole, north of Skipper's, no. 9986. See p. 490.

*V. PRIMULIFOLIA L., var. VILLOSA A. Eaton. DINWIDDIE COUNTY: peaty clearing north of Burgess Station, no. 9985. GREENSVILLE COUNTY: sandy plowed field about 1 mile northwest of Dahlia, no. 9755. Seen at other stations.

DIRCA PALUSTRIS L. To the single station reported add others also in SURRY COUNTY: dry wooded slope by College Run, about 1 mile west of Highgate, no. 9988 (no. 9384, labeled as from east of Blizzard's Corners, is from the same station); rich wooded ravine northwest of Bacon's Castle, no. 9758; Mr. George Mason tells us of another station, back of the John Rolf house, between Surry and Scotland. See p. 477.

*LAGERSTROEMIA INDICA L. GREENSVILLE COUNTY: spreading in a bushy clearing at the North Carolina Line, near Fontaine Creek, southwest of Haley's Bridge, no. 9602.

RHEXIA CILIOSA Michx. To the few recorded stations add many in GREENSVILLE and NANSEMOND COUNTIES (many nos.). See p. 472.

EPILOBIUM COLORATUM Muhl. SURRY COUNTY: along rills, gullies in rich beech woods 1½ miles north of Surry.

Certainly very local on the Coastal Plain; collected by Grimes at Williamsburg.

*OENOTHERA FRUTICOSA L., var. **microcarpa**, var. nov. (TAB. 576, FIG. 1 et 2), caule glabro vel supra minute piloso; foliis lineari-lanceolatis glabris vel glabratis repando-dentatis; capsulis longe stipitatis strigoso-pilosis corporibus 3.5–4 mm. longis.—Prince George County, VIRGINIA: argillaceous and siliceous boggy depression about 3 miles southeast of Petersburg, on headwaters of Blackwater River, June 25, 1936, *Fernald, Long & Smart*, no. 5860 (TYPE in Gray Herbarium); similar habitat at head of Poo Run, June 19, 1936, *Fernald, Long & Smart*, no. 5858.

The specimens were distributed under the inclusive name *Oenothera fruticosa;* but now that we have the very illuminating treatment of the subgenus *Kneiffia* by Munz[1] it is apparent that the tiny-fruited plant of the boggy depressions of Prince George County is not accounted for in his treatment. By his statement our plant comes nearest to *Oe. fruticosa*, var. *subglobosa* (Small) Munz of Georgia and Alabama; but that has the capsule (PL. 576, FIG. 3) only minutely puberulent. *Kneiffia arenicola* Small, with capsules as small as in *Oe. fruticosa*, var. *microcarpa*, is described as having densely silvery-silky leaves. PLATE 576, FIG. 1 shows the summit of the TYPE, × 1; FIG. 2 is a

[1] Philip A. Munz: Studies in Onagraceae X. The subgenus Kneiffia (genus Oenothera) and miscellaneous new species of Oenothera. Bull. Torr. Bot Cl. lxiv. 287 et seq. (1937).

capsule, × 5, to show the pubescence. FIG. 3 shows a capsule, × 5, of var. *subglobosa* from Stone Mt., Georgia, *A. H. Curtis*, no. 6472.

*OE. FRUTICOSA L., var. **unguiculata**, var. nov. (TAB. 577, FIG. 1–3), caule 0.5–1 m. alto piloso, pilis copiosis divergentibus; foliis subvelutinis vel pilosis anguste lanceolatis subintegris; calicibus dense pilosis alibastris apicibus liberis subulatis unguiculatis 1–1.5 mm. longis; capsulis clavato-ovoideis valde sulcatis divergente hirsutis corporibus 5–6 mm. longis.—Southeastern Virginia to South Carolina. VIRGINIA: dry pine woods south of Skipper's, Greensville County, May 21 and July 18, 1939, *Fernald & Long*, nos. 9991 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.), and 10,747; peaty and argillaceous swale north of Littleton, May 22, 1939, *Fernald & Long*, no. 9990. SOUTH CAROLINA: low grounds, Columbia, June 16, 1855, *Hexamer & Maier*.

Var. *unguiculata* in its long sepal-tips is quite unlike the other varieties of *Oenothera fruticosa*. As defined by Munz, *Oe. fruticosa* has "sepals . . . with narrow tips up to about 1 mm. long, these not free or, if free, not strongly divaricate." PLATE 577, FIG. 1 shows the TYPE, × ⅖; FIG. 2 is a bud, × 3, showing the dense pubescence and the free unguiculate sepal-tips; FIG. 3, a fruit, × 5, from the TYPE-COLONY (no. 10,747). FIG. 4 is a characteristic full-grown bud, × 3, of *Oe. fruticosa*, var. *vera* Hook., as identified by Munz, from Penn's Grove, New Jersey, *Mary H. Williams*.

*OE. SPECIOSA Nutt. PRINCE GEORGE COUNTY: naturalized in dry open field, Camp Lee, no. 9989. ISLE OF WIGHT COUNTY: spreading on roadside bank southeast of Windsor, no. 10,748.

MYRIOPHYLLUM HETEROPHYLLUM Michx. GREENSVILLE COUNTY: closely filling two small woodland ponds, one about 1 mile north of Skipper's, no. 9798, the other just north of Dahlia, no. 9799, the latter with gigantic fruiting plants with numerous scorpioid branches at the center of the pond, but with more slender sterile plants at the margin (no. 8797), these superficially suggesting *M. pinnatum*.

*M. BRASILIENSE Cambess. (*M. proserpinacoides* Gill.). JAMES CITY COUNTY: abundant in brook in woods south of Williamsburg, no. 8796.

The cultivated "Water Feather," seen in other stations, especially in artificial ponds.

*PROSPERPINACA INTERMEDIA Mackenzie. WARWICK COUNTY: shallow pool in woods, north of Lee Hall, no. 8794.

Very abundant, growing with typical *P. palustris* and *P. pectinata* (the latter not seen by Grimes). See p. 468.

HEDERA HELIX L. PRINCE GEORGE COUNTY: abundantly natural-

ized and heavily flowering, rich alluvial woods and thickets by James River, Upper Brandon, no. 9386.

A very extensive colony, the shrubs climbing high in and choking the trees, the lower and sterile branches with angulate leaves, the upper and fertile with unlobed ovate blades. The "English Ivy," closely embracing the trees of *Bumelia*, *Celtis*, *Albizzia* and *Staphylea*, makes a most bizarre forest! See p. 478.

Sanicula canadensis L., var. floridana (Bickn.) H. Wolff. To the station, already reported, in Isle of Wight County, add one in Greensville County: border of dry pine woods about 1 mile south of Skipper's, no. 8800.

S. Smallii Bickn. Scattered in rich woods, always as a few plants only, from Hanover to Greensville and Southampton Counties (many nos.).

Chaerophyllum Tainturieri Hook Range extended north to Prince George County: base of wooded slope and in waste ground, City Point, no. 9760.

Zizia aurea (L.) Koch. Range extended into western margin of Coastal Plain in Sussex County: bottomland woods, Sappony Creek, west of Stony Creek, no. 9762.

*Oxypolis ternata (Nutt.) Heller. Greensville County: sphagnous bog about 1 mile northwest of Dahlia, nos. 8804, 8906 and 9390.

An extraordinarily rare species, described from somewhere in the Carolinas but seen by Coulter & Rose only from Apalachicola, Florida (there fruiting in November). In the representation at the New York Botanic Garden and in the Gray Herbarium the following (besides the abundant material from Apalachicola) are represented: one additional station in northern Florida; one in southern Georgia; two in southeastern North Carolina. When first noticed near Dahlia (in the bog carpeted with *Burmannia biflora*) only young leaves were found; on September 18 the few plants were flowering, on October 12 the petals were dropping; but on December 31, with ice over the bog, Mr. and Mrs. Correll, Mr. Long and I could find no sign that it had fruited. The young carpels had apparently shriveled without maturing, presumably from the absence of the right insect to insure pollination. See pp. 472, 485, 491 and map 8.

Thaspium trifoliatum (L.) Gray. See Fernald in Rhodora, xli. 442 (1939). Scattered stations in woods and thickets, Henrico County to Greensville and Southampton Counties (many nos.).

Rhododendron arborescens (Pursh) Torr. Southampton County: wet woods, Assamoosick Swamp, south of Sebrell, nos. 10,010,

Photo. W. H. Hodge

LEUCOTHOE RACEMOSA: FIG. 3, inflorescence, × 1, from New Jersey.

Var. PROJECTA: FIG. 1, portion of TYPE, × 1; FIG. 2, portion of raceme, × 5, from TYPE.

Var. ELONGATA: FIG. 4, portion of raceme, × 5, to show pilose rachis, pedicels, etc., from Florida.

Photo. W. H. Hodge

GENTIANA STONEANA: FIG. 1, TYPE, × 2/5; FIG. 2, flower, × 1.

10,361 (3.2 m. high); sphagnous swampy woods southwest of Applewhite Church, no. 10,362. ISLE OF WIGHT COUNTY: swampy woods bordering pine barrens, south of Zuni, no. 8808 (3 m. high). NANSEMOND COUNTY: woods and thickets, depressions in pine barrens, east of Cox Landing, south of South Quay, no. 10,762.

Characteristic of wet woods and thickets, especially in the depressions of pine barrens. Usually supposed to be restricted to the region of the Blue Ridge and the Alleghenies, Rehder (Rehder & Wilson, Mon. Azaleas, 167 (1921)) saying it is "distinctly a species of the Appalachian Mountain region and does not occur in the coastal plane [plain] but along the Susquehanna it descends to the southern part of Lancaster County, Pennsylvania, along the Potomac to Fairfax County, Virginia," etc.

KALMIA ANGUSTIFOLIA L., var. CAROLINIANA (Small) Fernald. Range extended inland to SOUTHAMPTON COUNTY: wooded swamp about 7 miles south of Franklin, no. 10,002. NANSEMOND COUNTY: white sand of pine barrens, southwest of South Quay, no. 10,366. See p. 490.

*LEUCOTHOE RACEMOSA (L.) Gray, var. **projecta**, var. nov. (TAB. 578, FIG. 1 et 2), racemis plerumque 0.6–2 dm. longis, rhachi glabro; ramulis glabris vel deinde glabratis.—Southeastern Virginia to Georgia and eastern Tennessee. VIRGINIA: margin of pool in pine woods east of Little Creek, Princess Anne County, May 4, 1935, *Fernald & Griscom*, no. 4481; swampy woods near Steere's Pond, northeast of Burgess Station, May 19, 1939, *Fernald & Long*, no. 10,003 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.). NORTH CAROLINA: low oak-pine woods, 4 miles east of Bolton, Columbus Co., July 5, 1927, *Wiegand & Manning*, no. 2383; swampy woods, southeast of Maysville, April 17, 1933, *J. M. Fogg, Jr.*, no. 5545; cypress swamp near Wilmington, April 23, 1923, *Churchill*. SOUTH CAROLINA: Waccaman River swamps near Bull Creek, Horry County, April 22, 1932, *Weatherby & Griscom*, no. 16,613; near Beaufort, May 5, 1917, *Churchill;* Porcher's Bluff, Christ Church Parish, Charleston County, April 16, 1911, *E. A. Mearns*, no. 69. GEORGIA: dry white sand south of Open Pond, Decatur County, August 13, 1901, *Harper*, no. 1217. TENNESSEE: border of woods, Wolf Creek, May 15, 1900, *Ruth*, no. 191.

Var. *projecta*, when well developed, has amazingly longer racemes than typical *Leucothoë racemosa* (based on *Andromeda racemosa* L., from eastern Pennsylvania), the wide-spread and northern shrub (FIG. 3) having them 2–5 (rarely –7) cm. long. Var. *projecta*, likewise, tends to have larger flowers, but I can find no morphological characters to separate them.

Var. *projecta* has recently been included by Small in *Leucothoë elongata* Small in Bull. N. Y. Bot. Gard. i. 284 (1899) when, in his Manual, he treated it as *Eubotrys elongata* with the range "Acid swamps and sandhill ponds, Coastal Plain, Fla. to La. and S. Va." Originally *L. elongata* was described only from Florida, the characteristic shrub, occurring from Georgia and Florida to Louisiana, with closely pilose branchlets and rachises and with ciliate sepals (FIG. 4). So far as I can make out the latter shrub has no other characters to separate it from the glabrous long-racemed variety of southeastern Virginia and even from the short-racemed typical *L. racemosa.* Dr. Britton apparently balked at making a transfer of it. Treating *Leucothoë racemosa* in Ill. Fl. ed. 2, as *Eubotrys racemosa* (good old *Leucothoë*, § *Eubotrys* Gray), he said "**Leucothoë elongata** Small, of the Southern States, is of this genus . . . as far north as Virginia"; but, although placing *L. racemosa* under *Eubotrys*, Britton kept *L. elongata* as *Leucothoë*! I am calling it

LEUCOTHOË RACEMOSA (L.) Gray, var. **elongata** (Small), comb. nov. *L. elongata* Small in Bull. N. Y. Bot. Gard. i. 284 (1899). *Eubotrys elongata* Small, Shrubs of Florida, 95, 133 (1913).—Georgia and Florida to Louisiana. PLATE 578, FIG. 4, portion of raceme, × 5.

In PLATE 578, FIG. 1 is a characteristic inflorescence, × 1, of the type of *Leucothoë racemosa*, var. *projecta;* FIG. 2, flowers and a portion of the glabrous rachis, × 5, from the TYPE; FIG. 3, a characteristic inflorescence, × 1, of typical *L. racemosa* from the general type-region, Hammonton, New Jersey, *Wm. Bassett;* FIG. 4, flowers and portion of the pilose rachis, × 5, of var. *elongata* from north of Aucilla, Jefferson County, Florida, *Griscom*, no. 21,482.

BUMELIA LYCIOIDES (L.) Gaertn. f., var. VIRGINIANA Fernald in RHODORA, XXXVIII. 439 (1936). PRINCE GEORGE COUNTY: rich alluvial woods and thickets by James River, Upper Brandon, no. 9396.

At this point the endemic *Bumelia* of southeastern Virginia is very abundant, making a striking feature of the alluvial thicket, the small and (in September, 1938) heavily fruiting trees reaching a height of 4.5 m., with trunks up to 1.5 dm. in diameter. See p. 478.

STYRAX AMERICANA Lam. To the very few known stations in Virginia add the following. HENRICO COUNTY: swampy thicket bordering Whiteoak Swamp, south of Elko Station, no. 9394. SOUTHAMPTON COUNTY: swampy woods along Nottoway River, below Point Beach, south of Franklin, abundant, no. 10,780. NANSEMOND COUNTY: low sandy woods along Blackwater River, George's Bend, south of South Quay, no. 10,781, abundant. See p. 478.

*Gentiana cherokeensis (W. P. Lemmon) Fernald in Rhodora, xli. 487 (1939). Sussex County: moist argillaceous pineland ("flat pineland") about 2 miles east of Stony Creek, nos. 9617, 9685. See pp. 486, 487 and map 14.

Very distinct from *Gentiana Saponaria* L. in its linear-lanceolate leaves and its longer and stiffly erect calyx-lobes, as well as in the deeper-blue corolla with conspicuous darker longitudinal bands. The only station known north of northwestern Georgia.

G. Catesbaei Walter, Fl. Carol. 109 (1788). Described in the brief phrase under the group with campanulate ventricose corollas, *G. Catesbaei* was further defined only by the brief "corollis extus caeruleis, foliis lanceolatis remotis," as contrasted with *G. Saponaria* sensu Walter, not Linnaeus, which was defined "corollis viridescentibus, foliis ovatis trinerviis". The latter, of course, was the greenish-flowered *G. villosa* L., whereas, as shown by a photograph kindly sent me by Mr. Ramsbottom of the only gentians in the Walter herbarium, his *G. Catesbaei* covered both a plant suggesting *G. Saponaria* L. in the strict sense and *G. Elliottii* Chapman, which, because of the earlier *G. Elliottea* Raf., has been passing as *G. parvifolia* (Chapm.) Britton. Asa Gray, not recognizing the latter species, treated Walter's *G. Catesbaei* as identical with *G. Saponaria.* Since Walter's material contained both a plant similar to the Linnean *G. Saponaria* and the plant with open-campanulate erect corollas subsequently called *G. Elliottii* Chapman and *G. parvifolia* (Chapm.) Britton, I am taking up the name G. Catesbaei Walter for the latter southeastern species, thus following the earlier treatments.

G. **Stoneana,** sp. nov. (tab. 579), perennis pergracilis; caulibus solitariis vel paucis teretibus glabris 2–6 dm. longis arcuatis vel suberectis simplicibus vel 2–3-furcatis; foliis angustissime linearibus vel lineari-oblanceolatis crassis, 7–15-jugis; floribus pedunculatis linearibracteatis vel nudis; calicis lobis foliis superioribus valde similibus; corollis intense azureis vel indicis tubo obconicis intus brunneo-maculatis, limbo valde patentibus vel rotatis, lobis ovatis vel late oblongis 1.3–2 cm. longis plica multifida duplo longioribus.—Pine barrens of New Jersey and locally from southeastern Virginia to South Carolina. Type: siliceous and argillaceous thicket north of Factory Hill, Nansemond County, Virginia, *Fernald & Long*, no. 9611 (in Herb. Gray; isotype in Herb. Phil. Acad.).

Gentiana Stoneana is the exquisite species which erroneously passes as *G. Porphyrio* J. F. Gmelin. It was described from South Carolina as *G. angustifolia* Michx. Fl. Bor.-Am. i. 177 (1803) and under that

name it was known to Grisebach and to Gray (Synoptical Flora), but Michaux's name can not now be maintained because of the earlier *G. angustifolia* Vill. (1787). The name *G. Porphyrio* J. F. Gmelin was cited by Grisebach in its synonymy and, since its adoption in Britton & Brown and in Gray's Manual, ed. 7, in place of *G. angustifolia*, has become very firmly established. Gmelin never saw the plant and certainly did not newly describe it. He merely gave a substitute name for *G. purpurea* Walter, not L. Walter's *G. purpurea* was very briefly and vaguely described. He had three species of *Gentiana:* two under the section "corollis campanulatis ventricosis" (his *G. Saponaria*, which was *G. villosa* L., and his *G. Catesbaei*, which was partly *G. Elliottii*, as above pointed out); and under "Corollis infundibuliformibus" his

purpurea 3. corollis intus laete purpureis; caule simplici, fol. linearibus.

The only species of *Gentiana* represented in Walter's herbarium are, as indicated by me under the discussion of *G. Catesbaei*, mere fragments of the latter, of *G. villosa* L. (*G. Saponaria* sensu Walt., not L.) and of something resembling true *G. Saponaria*. There is nothing resembling *G. Stoneana* (*G. angustifolia* Michx., not Vill.). Whether the latter occurs in Walter's territory is doubtful; I have seen none from there in the herbaria examined; and certainly the description of the corolla as infundibuliform and bright purple within could not have been applied to *G. Stoneana* with intense blue corolla with brown speckling on the inside of the obconic tube and with conspicuous rotate limb. Among the unsettled species of *Gentiana* which Long and I have found in Southampton County, Virginia is one with narrowly lanceolate to linear leaves and purple-violet to crimson or "rose-purple" infundibuliform corollas. It is also in the Gray Herbarium from Beaufort County, South Carolina; and I have seen it at the New York Botanical Garden from eastern North Carolina. It has erroneously passed as the prairie species, *G. puberula* Michx. It certainly is not that, but whether it is *G. purpurea* Walt. must await further study. It is highly probable that it is. At any rate, I find myself quite incapable of believing, when Walter described a plant with infundibuliform corolla lively purple within, that he referred to a plant with rotate azure- or indigo-blue flower. As stated, *G. Porphyrio* was merely a substitute-name given by Gmelin to replace *G. purpurea* Walt., which he did not know, but the name obviously referred to the conventional purple of porphyry.

Whatever *G. purpurea* is *G. Porphyrio* is the same. In view of the occurrence in Walter's area of a little known gentian with narrow leaves and truly infundibuliform purple corollas it is only right, in the absence of a preserved type, to suppose that Walter had such a plant. Its status as a species awaits fuller material and more critical study.

Gentiana Stoneana I name with great pleasure for the distinguished student of the Pine Barrens of New Jersey, the late WITMER STONE. Stone's keen appreciation of this plant was vividly shown in his following brief comment: "It is probably a matter of individual preference to determine which gentian is the handsomest. The present species, found only in the remote sections of the Pine Barrens, is certainly the least known and to my mind as handsome as any. Its flaring mouth, the delicate markings within, and the intensity of the blue, make it one of the choicest blooms of the region"—Stone, Pl. So. N. J. 640. No plant could more appropriately commemorate Witmer Stone than this retiring and distinguished gentian, with its flowers of true blue.[1]

In RHODORA, xxxix. 364 and 444 (1937) I recorded finding *Gentiana* "*Porphyrio*" south of Factory Hill, Nansemond County, Virginia. The road there has no state boundaries indicated and retravel of it shows that our station was actually within Gates County, North Carolina. Our no. 6852, as well as fuller material collected in October, 1938 (no. 9612) should be indicated as from "border of moist argillaceous pine and oak woods 1½ miles northeast of Dort School, Gates County, North Carolina." See p. 487.

PLATE 579 shows as FIG. 1 a couple of plants, × ⅖, the TYPE of GENTIANA STONEANA. FIG. 2 is a flower, × 1.

AMPELAMUS ALBIDUS (Nutt.) Britton (*Gonolobus laevis* sensu Vail, not Michx.). See Perry in RHODORA, xl. 286 (1938). HENRICO, PRINCE GEORGE and SURRY COUNTIES: rich alluvial woods and thickets (many nos.). See p. 475 and MAP 10.

PHACELIA DUBIA (L.) Trel. To the single Coastal Plain station (in Greensville County) add others in SOUTHAMPTON, SUSSEX and DINWIDDIE COUNTIES (several nos.). See p. 489.

In eastern Virginia *Phacelia dubia* is one of the indigenous weeds and ruderals, springing up early (flowering from early April into May) in fields, roadsides and waste places and becoming mostly dried and unrecognizable by June.

[1] The smaller white-flowered species of Florida is GENTIANA **tenuifolia** (Raf.), **comb. nov.** *Diploma tenuifolia* Raf. Fl. Tell. iii. 27 (1837). *Dasystephana tenuifolia* (Raf.) Pennell in Bull. Torr. Bot. Cl. xlvi. 183 (1919).

Hydrolea quadrivalvis Walt. Range extended north from the southernmost counties to Chesterfield County: margin of exsiccated old millpond in Swift Creek, Lakeview, no. 9413. See p. 477.

*Myosotis macrosperma Engelm. Prince George County: rich deciduous woods, Coggins Point, no. 10,016; alluvial woods by Wall's Run, northwest of Garysville, no. 10,017. Surry County: alluvial woods along Gray's Creek, west of Old Courthouse Corners, no. 10,018; border of cypress swamp along College Run, about 1 mile west of Highgate, no. 10,019.

Although treated in Gray's Man., ed. 7 merely as a trivial variety, var. *macrosperma* (Engelm.) Fernald, of *Myosotis virginica*, that disposition is not justified. True *M. macrosperma*, characteristic in southeastern Virginia of the rich calcareous soils of the Miocene fossil-beds south of the James and found by us nowhere else, is sharply defined as a species. Its disagreeable habit of maturing its fruits in two or three days and conferring them (in the glochidiate-bristly large calices) upon the clothes of passing intruders is a character not conspicuous in *M. virginica* of thin and sterile soils. See p. 493.

Physalis monticola C. Mohr. To the first Virginian station (in Southampton County) add two in Dinwiddie County: borders of dry oak and pine woods north of Burgess Station, no. 10,021; dry hickory and oak woods 2–3 miles east of Dinwiddie, no. 10,022.

*Linaria canadensis L., var. texana (Scheele) Pennell. Dinwiddie County: sandy fields and clearings southwest of Petersburg, no. 10,023.

A characteristic southern extreme but in Virginia (as about Charleston, South Carolina, where we watched it in April) with a perfectly continuous series connecting the extreme large-flowered plants with the very small-flowered typical *L. canadensis*. There is no good reason to call the innumerable transitional specimens hybrids of two distinct species, as Pennell has recently implied (Scroph. E. Temp. N. Am. 302). His original treatment showed better understanding of the plants. If the species hybridize so freely that most specimens in an old field are intermediates the value of the two extremes as distinct species is nullified. The seeds, like the flowers, are quite inconstant. See p. 490.

*Chaenorrhinum minus (L.) Lange (*Linaria minor* (L.) Desf.). Henrico County: railroad cinders, Elko Station, nos. 8842, 9137. Dinwiddie County: similar habitat, Petersburg, nos. 10,813, 10,814. See p. 473.

Pennell, l. c. 318, had seen (in 1935) no material from south of Pennsylvania.

SCROPHULARIA MARILANDICA L. To the single Coastal Plain station (in Sussex County) reported add others in SOUTHAMPTON and DINWIDDIE COUNTIES (various nos.).

(*To be continued*)

A NEW CHINESE ELEOCHARIS.—ELEOCHARIS **yunnanensis**, n. sp. aff. *E. multicaulo*, rhizomate crasso descendente, culmis erectis vel recurvatis, 1.5–4 dm. longis, striatis, griseo-viridiscentibus, 0.5–1.0 mm. diametro; vaginis superioribus purpurascentibus, in apice acutis; spiculis 4–7 cm. longis, ovatis vel ellipticis, subacutis, 6–10-floris, frequenter proliferis; glumis purpureis, obtusis, non carinatis, apice hyalinis; stylo 3-fido; staminibus 3, antheris 1.5 mm. longis; achaenio trigono anguste obovato, 1.5 mm. longo, nitidulo flavescente, subtiliter striato-reticulato; stylobasi angusto, trigono, conico, non lobato; setis albidis vel brunneis, achaenio paullo longioribus.—CHINA: mountain slope, 3000 m., Wei-si Hsien, Yunnan, *C. W. Wang* no. 67819 (TYPE in Gray Herb.); mountain slope, 2300 m., Li-Kiang Hsien, *Wang* no. 71207; stream, 2600 m., Ta-li Hsien, *Wang* no. 63126; stream on mountain, 2300 m., Kun-Ming, *Wang* no. 62972.

This may be looked upon as a mountain species of the PELLUCIDA group, and the oriental representative of *E. multicaulis*, from which it differs chiefly in its somewhat smaller, yellow achenes and brighter scales. Superficially it resembles *E. Bolanderi* of the western United States. To Dr. E. D. Merrill I am indebted for the privilege of seeing the material, all of which is now in the Gray Herbarium.—H. K. SVENSON, Brooklyn Botanic Garden.

PLANTAGO VIRGINICA IN MAINE.—Two living specimens of *Plantago virginica* L., were brought to the Portland Society of Natural History by Miss Helen Pitman, July 7, 1937. Miss Pitman found the plants growing on her lawn in South Portland; her search failed to reveal another specimen. The plants were mature and agree in floral characters and pubescence with figures published by Dr. M. L. Fernald in 1938[1] and with specimens collected in Indiana.

This find seems to call up the status of an early report of the species in the Maine flora. In 1862 Dr. George L. Goodale included it without comment in his "Catalogue of the Flowering Plants of Maine."[2]

[1] 1938, Fernald, RHODORA *40* Plate 530, figs 1, 2 and 3.
[2] 1862, Goodale, Proc. Portland Soc. Nat. Hist,. I, (1) 56.

Dr. M. L. Fernald carried it forward in his "Portland Catalogue of Maine Plants,"[1] but in his first "Supplement to the Portland Catalogue"[2] removed it to a list of species for which no station was known.

Again, in a lecture before a meeting of the Josselyn Botanical Society of Maine, held in Wells, August 8–11, 1916, illustrating his remarks with specimens, Dr. Fernald focused attention upon about twenty plants[3] recorded from southwestern Maine, of which no specimens were known to exist in collections. This group included the present species.

While a number of those hypothetical plants have now been found in Maine, a fruitless search for this plantain by the active collectors of York and Cumberland Counties has been made. Some of us, at least, had assumed that the report of *Plantago virginica* in the state implied an outlying station for this southern species, like those for *Chamaecyparis thyoides*, *Salicornia ambigua*, *Acnida cannabina*, *Quercus montana*, *Benzoin aestivale*, *Cornus florida*, *Aster laevis*, *A. subulatus* and others.

A better knowledge of the range of this plantain, brought about through the careful explorations of numerous field botanists, during the past two decades or more, has shown that this view is extremely improbable. Those of us historically minded will like to recall that at the time Dr. Goodale worked in Portland and his native York County, the coasting trade was near its zenith, extending from the ports of Maine to those of the South Atlantic States and even the Gulf States, with a host of sailing vessels bringing all types of merchandise and often part cargoes of ballast to our shores. Various plant waifs, some permanent introductions, others enduring a single season only, through that means crept into the old catalogue.

Whether or not *Plantago virginica* belongs in that category, it may now take its place among the fugitive species which have appeared in our flora.—ARTHUR H. NORTON, Museum, Portland Society Natural History.

[1] 1892, Fernald, l. c. II, (1) 59.
[2] 1895, Fernald, l. c. II, (3) 94.
[3] 1920, Fernald, Bull. Josselyn Bot. Soc. *6*, 6; 8.

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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 41. **December, 1939.** **No. 492.**

NOTES ON TEXAS PLANTS[1]

V. L. Cory

What appears to be an undescribed species of Petalostemum was discovered in the Chisos Mountains by the writer, September 26, 1938. A colony of fifty or more of these plants, all in bloom and some beginning to fruit, were growing in moist gravel at the edge of running water along Boot Creek, on the summit of these mountains, and at less than a mile from the South Rim.

Petalostemum **oreophilum**, sp. nov., annuum, glabrum; caule 15–40 cm. alto, 1 mm. diametro, erecto tereti plerumque simplice vel ramis paucis erectis vel adscendentibus; foliis 2.5–4 cm. longis adscendentibus, foliolis 13–21, saepius 19, oblongo-cuneatis, ad 5 cm. longis 1.5 mm. latis apice emarginatis glabris, pagina superiore pallide viridibus inferiore caerulescenti-viridibus minuteque punctatis; spicis cylindricis densis villosissimis ad 6 cm. longis et 1 cm. latis; bracteis ovatis 4 mm. longis acuminatis villosis, marginibus scariosis; calyce dense villoso glanduloso 3 mm. longo, lobis anguste lanceolatis tubumque aequantibus; corolla 5 mm. longa purpurascente, vexilli lamina oblongo-ovata 2 mm. longa, ungui 3 mm. longo; petalorum alterum laminis ellipticis minus quam 2 mm. longis; legumine oblique obovoideo sublunato 2.5 mm. longo 2 mm. lato superne villoso; seminibus sublunatis 2 mm. latis compressis, latere unico concavis opacis brunnescentibus.

Petalostemum **oreophilum** n. sp. Plant a glabrous annual with slender taproot; stem 15–40 cm. tall, 1 mm. broad; erect, terete, usually simple or with only a few erect or ascending branches; stipules subulate, fugacious; leaves 2.5–4 cm. long, ascending; leaflets 13–21, frequently 19, oblong-cuneate, up to 5 mm. long and 1.5 mm. broad, emarginate at the apex, glabrous, light-green above, bluish-green and

[1] Printed at the expense of the author to insure immediate publication.

minutely dotted beneath; spikes cylindric, dense, very villous, up to 6 cm. long and 1 cm. broad; bracts ovate, 4 mm. long, acuminate, villous, the margins scarious; calyx densely villous, glandular, 3 mm. long, the lobes narrowly lanceolate and as long as the tube; corolla 5 mm. long, purplish; blade of the banner oblong-obovate, 2 mm. long, the claw 3 mm. long; blades of the other petals elliptic, less than 2 mm. long; pod obliquely obovoid, somewhat lunate, 2.5 mm. long, 2 mm. broad, villous above; seed somewhat lunate, 2 mm. broad, flattened, one surface concave, dull and brownish.

In certain respects this plant is closely related to *P. emarginatum*, which, however, is several-branched and with the branches decumbent. Also *P. emarginatum* is less leafy and has fewer leaflets to the leaf, and in appearance is quite unlike our plant of the mountains. The type specimen is deposited in the Gray Herbarium.

While on a field trip with Mr. H. B. Parks to the Big Bend country of Texas in April, 1936, alongside a ranch road and a shallow draw leading down to Alamo de Caesario Creek, just north of Agua Fria Mountain, two white-flowered plants of a species of Nama were seen and were collected. To us these plants were different from *Nama Havardii*. Recently, April 3, 1939, on a trip to the same locality with Mr. O. A. Beath of the Wyoming Experiment Station, at a point five miles northeast of the original locality, in a gravelly wash above and to the west side of the gullied bed of Terlingua Creek and in a space possibly 50 feet wide and 150 feet long a hundred or more of these white-flowered plants were observed, growing in almost a pure stand. Material of both collections, 1936 and 1939, has been seen by Dr. C. Leo Hitchcock. I concur with his opinion that our plant more properly should be distinguished as a variety of *Nama Havardii* than as a separate species.

Nama Havardii A. Gray, var. **album**, var. nov., quam varietas typica major patentior succulentior; corolla alba.

Nama Havardii A. Gray, var. **album**, n. var. Differs from the species in having a pure white corolla, and its tendency to make a large, more succulent and more spreading growth.

Although *Nama Havardii* was described as being perennial, in our experience it is of annual duration, growing from a stout taproot. As the white-flowered form is larger in several respects than is the species a detailed description seems desirable.

Plant a succulent, cinereous-villous annual, up to 25 cm. tall and 30 cm. broad, from a stout taproot; stem branched from the base and branched above, the branches stout, ascending-spreading, terete, 1–3

mm. in diameter, densely cinereous-villous; leaves fleshy, densely villous on both surfaces, oblong-elliptic to obovate, up to 4 cm. long and 13 mm. broad, narrowed to slender petioles; flowers borne in lax cymes on slender pedicels, which are up to 5 mm. long; calyx-lobes linear-spatulate, in anthesis 6–7 mm. long, elongating in fruit to 11–12 mm. long, densely villous; corolla tubular-campanulate, pure white, up to 13 mm. long, mostly about 12 mm. long; stamens unequally inserted towards the base of the corolla, the free portion terete, 2–3 mm. long, the adnate portion thickened and much expanded, 3.5–5 mm. long; styles free, mostly 3.5–4 mm. long; capsules about 5 mm. long; seeds brown, minutely pitted.

The variety apparently is of local occurrence only, growing in the gravelly beds of Alamo de Caesario and Terlingua Creeks and their tributaries at and above the junction of these two water courses, but possibly only sparsely on down Terlingua Creek below this junction. At fifteen miles lower down Terlingua Creek a tributary had an abundance of *Nama Havardii* in excellent development, but there were none of the plants having pure white flowers. The type specimen, No. 18602, was collected April 13, 1936, at 18 miles north and slightly west of Terlingua on an airline, in Brewster County, Texas. It is deposited in the Gray Herbarium.

The first collection in Texas of *Nama torynophyllum* Greenm. was made by Mr. Hugh C. Cutler, March 4, 1937, at two miles east of Castolon, in Brewster County. Two subsequent collections have been made by the writer. One of these was taken September 28, 1938, at 1½ miles north of Castolon, or in the same general vicinity as the first collection, while the other was taken April 5, 1939, in the moist gravelly bed of Maravillas Creek, 45 miles northeast on an airline from the locality of the previous collections. This mat-like plant with its small, deeply cup-shaped leaves is something of a curiosity.

Some of the plants of southwestern Texas seemingly were described from growth not of the best development. *Lupinus Havardi* S. Wats. may be taken as an example. As described in "Botany of West Texas," by John M. Coulter, the stems are 30–45 cm. high, which certainly would be rather a modest plant. Mr. O. A. Beath and myself on April 3, 1939, noted a plant of this species, growing in the gravelly bed of Terlingua Creek at 13 miles northeast of Terlingua, that had a spread of four feet and was about two feet high and bore something like fifteen racemes of deep purple flowers, the racemes being nearly two feet in length. This truly is a magnificent blue-bonnet, as the lupines are called in Texas; and a lupine is the State

flower of Texas. However, not many Texans ever have seen *Lupinus Havardi*. Is not this species the most magnificent lupine of the United States? Mr. Beath photographed this particular plant.

Texas Agricultural Experiment Station
Agricultural and Mechanical College of Texas.

LAST SURVIVORS IN THE FLORA OF TIDEWATER VIRGINIA

M. L. Fernald

(*Continued from p. 559*)

Veronica Anagallis-aquatica, forma anagalliformis (Boreau) G. Beck (*V. glandifera* Pennell). Spring-heads, ditches and pools, various stations in James City, Surry and Nansemond Counties (many nos.). Plates 580 and 581.

I have studied for many days the series of circumboreal material of *Veronica Anagallis-aquatica*, vainly striving to find the two endemic American species, *V. glandifera* Pennell in Torreya, xix. 170 (1919) and *V. connata* Raf. Med. Fl. ii. 110 (1830) or *V. catenata* Pennell in Rhodora, xxiii. 37 (1921), maintained by Pennell. It seems to me that many specimens of American *V. glandifera* (pl. 580, figs. 1, 3 and 5; pl. 581, figs. 1, 4 and 6) are quite inseparable from the plants of European *V. Anagallis-aquatica* (or *V. Anagallis* of most European authors) with a few glandular hairs in the inflorescence (pl. 580, figs. 2, 4 and 6; pl. 581, figs. 2 and 5); and certainly, if the few glands are discounted, it is to me quite impossible to separate material from the type-region (vicinity of Suffolk, Virginia, pl. 581, fig. 6) from a large series of typical European and Asiatic *V. Anagallis-aquatica*. The differences between *V. Anagallis-aquatica* and *V. glandifera* given by Pennell are as follows:

"E. Stems distally, rachis, and pedicels glabrous or nearly so; sepals acute to slightly acuminate; style 1.5–3 mm. long; leaf-blades oblong-ovate, mostly widest about the middle, slightly serrate to nearly entire . . . . . 17. *V. anagallis-aquatica.*

EE. Stems distally, rachis, and pedicels pubescent with gland-tipped hairs; sepals strongly acuminate; style 1–1.5 mm. long; leaf-blades lanceolate or broadly lanceolate, widest near the base, usually more strongly serrate. 18. *V. glandifera.*"

In Europe, however, *Veronica Anagallis-aquatica* (or *V. Anagallis*)

Photo. W. H. Hodge

VERONICA ANAGALLIS-AQUATICA, forma ANAGALLIFORMIS (*V. glandifera*): FIG. 1, branch, × 1, from Virginia; FIG. 2, young branch, × 1, from Ireland; FIG. 3, fruits, × 8, from Virginia; FIG. 4, fruits, × 8, from Ireland; FIG. 5, fruit, × 8. from Virginia; FIG. 6, fruit, × 8, from Switzerland.

Photo. W. H. Hodge

VERONICA ANAGALLIS-AQUATICA: FIG. 3, fruit, × 8, from Italy.

Forma ANAGALLIFORMIS (*V. glandifera*): FIG. 1, branch, × 1, from Virginia; FIG. 2, young branch, × 1, from Sweden; FIG. 4, fruit, × 8, from Virginia; FIG. 5, fruit, × 8, from Sweden; FIG. 6, fruit, × 8, from type-locality of *V. glandifera*, near Suffolk, Virginia.

is well known to have a variation of leaf-outline from oblong-ovate to lanceolate: "Folia oblongo-ovata vel lanceolata, acuta denticulata vel subintegerrima"—Hayek in Fedde, Repert. Beih. xxx[2]. 173 (1929); "Blätter . . . lanzettlich bis länglich, . . . gezähnt"—Römpp in Fedde, Repert. Beih. l. 159 (1928). In fact, the European students of *Veronica* consider the presence of glands in the inflorescence of no great taxonomic significance: "Kommt hin und wieder auch mit drüsenhaariger Traube vor = f. *anagalliformis* [Boreau Fl. du centr. de la France ed. 3, II 489]"—G. Beck, Fl. Nied.-Österr. ii. 1051 (1903); "Am meisten variabel ist die B e h a a r u n g. Auser den kahlen kommen in manchen Gegenden glandulöse Formen vor, die kahlstengelig, aber innerhalb der Infloreszenz ± drüsig sind: *f. anagalliformis* (Boreau . . .) Beck."—Schuster, *Unsere Wasserehrenpreise* in Mitteil. Bayer. Bot. Gesells. i. 537, 538 (1906).

Pennell feels that true *Veronica Anagallis-aquatica* with glabrous inflorescences is only "Naturalized from Eurasia"[1] in its broad North American range, because the earliest collection was made in 1883; but the form with some glands in the inflorescence (his *V. glandifera*) he considers an endemic and indigenous species of the eastern United States: "This was collected by Clayton in Virginia before 1739 . . . ; such an early date confirms the distributional evidence that *V. glandifera* is an indigenous species."[2] Only 17 pages before we are told by him of *V. arvensis*, which may occur "on cliffs and in open woods," that for it "Linnaeus cited other works back to . . . 1623, and among these were Gronovious and Colden; the latter showed the plant's early introduction to New York, and the former (Gronov., Fl. Virg. 4. 1739), based upon Clayton's number 369 . . . shows similar early introduction to Virginia." In the type-region, near Suffolk, Virginia, the glandular American form of *V. Anagallis-aquatica* (i. e. *V. glandifera*) occurs in ditches by the railroad; at its Surry County stations it is in the man-made wells at springheads on old plantations or in rills with European Water Cress and the introduced *Potamogeton crispus;* near Williamsburg it fills an artificially dammed stream or small pond, along with such obviously introduced species as the cultivated South American *Myriophyllum brasiliense* (*M. proserpinacoides*) and the European and generally cultivated Water Cress.

[1] Pennell, Scroph. E. Temp. N. A. (Acad. Sci. Nat. Phil. Mem. i.), 363 (1935).
[2] Pennell, l. c. 364 (1935).

The second species, similar to *Veronica Anagallis-aquatica* in having sessile cauline leaves, is the plant (PL. 582 and 583) which differs from it in having fewer (5–35)-flowered racemes with more loosely and horizontally divergent pedicels; the smaller corolla roseate to white (instead of larger and bluish-lilac); the round-reniform or broadly obcordate deeply notched capsules mostly longer than the blunt or merely acutish lance-oblong or narrowly ovate sepals. This, like *V. Anagallis-aquatica*, may be either glabrous throughout or more or less glandular at summit or in the inflorescence. It has been treated by Pennell as an endemic North American species, ranging across the continent, from New England and southern Quebec to the Pacific, and southward to southern Pennsylvania, Tennessee, Missouri, Oklahoma, New Mexico, Arizona and southern California. the glabrous form mostly western, the glandular one mostly eastern. The glabrous plant is *V. catenata* Pennell in RHODORA, xxiii. 37 (1921); the glandular one *V. catenata glandulosa* (Farwell) Pennell, l. c. (1921), based on *V. Anagallis-aquatica*, var. *glandulosa* Farwell in Rep. Mich. Acad. Sci. xix. 249 (1917). In his later study[1] Pennell takes up for the American series which he had called *V. catenata* the very incorrectly or erroneously described and wholly doubtful *V. connata* Raf. Med. Fl. ii. 110 (1830), which was said by its author to be close to *V. scutellata*, and which was assigned perfoliate and entire leaves such as are not found in our plant. Pennell recognized that Rafinesque's account lacked absolute clarity, but he felt "that we must replace the name of *V. catenata* by *V. connata;* it is regretfully that I do so because the latter name is actually, though not obviously, a misnomer."

It seems to me from close comparison of specimens that there is no need to take up for the plant under consideration the very doubtful *V. connata* Raf.; neither is *V. catenata* Pennell required for it. I am quite incapable of separating ths American series (PL. 582, FIG. 1; PL. 583, FIGS. 1 and 3) from the Eurasian series (PL. 582, FIG. 2; PL. 583, FIGS. 2 and 4) which is there regularly passing as *V. aquatica* Bernh. Über Beg. Pflanzen. Art. 66 (1834). Since arriving at this conclusion after several days of close comparison I find that the same decision was earlier reached by Römpp in his study of the world-wide genus *Veronica*, "*Die Verwandtschafts-verhältnisse in der Gattung Veronica*," in Fedde, Repert. Beih. l. (1928). Here are Römpp's words: "Soviel sich der Originaldiagnose entnehmen lässt, scheint *V. catenata* Pennell

[1] Pennell, Scroph. E. Temp. N. Am. (Acad. Nat. Sci. Phil. Mon. i.), 364–370 (1935).

mit *V. aquatica* Bernh. identisch zu sein . . . *V. catenata glandulosa* (Farwell) Pennell würde, falls sich die oben angedeutete Vermutung beim Vergleich von Originalmaterial bestätigen lassen solte, der drüsigen Varietät *V. Anagallis* (= *V. aquatica*) var. *glandulosa* Čelak. der alten Welt entsprechen." (pp. 162, 163). Pennell, l. c. 329, refers to Römpp's "comprehensive paper on relationships in the Genus Veronica"; but he still maintains the American material as an endemic species.

Unfortunately, the name *Veronica aquatica* Bernh. (1834), the name used by Römpp, by Hayek, by Beck von Mannagetta and, apparently, by all modern European botanists, is a later homonym and, therefore, cannot be held. It is antedated by *V. aquatica* S. F. Gray, Nat. Arr. Brit. Pl. ii. 306 (1821). The latter name is illegitimate because an absolute substitute for *V. Anagallis-aquatica* L. (1753); but, since those who felt (and still feel) that illegitimate names should have no power to invalidate later legitimate but identical names, were overruled at Cambridge in 1930; and since the International Rules (Art. 61) state that: "Even if the earlier homonym is illegitimate . . . the later homonym must be rejected," it is obvious that *V. aquatica* Bernh. cannot be maintained. Römpp cites several binomials under it. The earliest of these is *V. tenerrima* F. W. Schmidt in Mayer, Sammlg. Phys. Aufs. i. 198 (1791), a very questionable plant, which has been referred in each case with seeming finality to all three species, *V. Beccabunga* L., *V. Angallis-aquatica* L. and *V. aquatica*! Schuster's discussion of it is to the point:

> Zu aquatica gehört nach Originalen auch *V. anagallis var. anagalloides C. Koch* teste Trautvetter (Herb. horti Petropolitani). Eine schwankende Stellung in der Literatur nimmt *V. tenerrima Schmidt Fl. boëm. 1793, I, 14* ein. Reichenbach (1862) wusste mit ihr nichts anzufangen. Beck (1893) stellte sie zu V. beccabunga, Ascherson (1898) zu der Landform von V. anagallis. Nach einem Originalexemplar (Comm. Kitaibel HRM) ist die Pflanze Schmidts eine in allen Teilen kleinere, oft wenigblütige, ca. 20 cm hohe Varietät von V. aquatica. Auf der Originaletikette bemerkt Schmidt: „An varietas sit Anagallidis, adhunc dubito, donec cultura decidat." Da sie Schmidt 1793 in seiner Flora boëmica als Art aufnahm, scheint sie sich samenbeständig gehalten zu haben. Wegen der ganzrandigen teilweise kurz gestielten unterem Blätter hielt sie Beck vermutlich für eine Form von beccabunga, aber alle Merkmale, namentlich auch der vierkantige Stengel, sprechen für aquatica.[1]

From this account the undesirability of taking up for the circum-

[1] Schuster in Mitteil. Bayer. Bot. Gesells. i. 538 (1906).

boreal *Veronica aquatica* the very doubtful *V. tenerrima* is apparent. Very similarly, *V. acutifolia* Gilib. Exercit. i. 119 (1792) is taken up unequivocally by Jávorka, Magyar Fl. 996 (1895) in place of *V. aquatica* Bernh., but Römpp as unequivocally puts it into the synonymy of *V. Anagallis-aquatica!* Its exact identity now becomes very important to make out. Passing *V. connata* Raf., which is surely very doubtful and with no authentic material known, we come to *V. salina* Schur, Enum. Pl. Transsylv. 492 (1866), with "Caule erecto, 2 ped. et altior. . . . Foliis anguste lanceolatis, . . . amplexicaulibus, . . . margine glanduloso-serrato-dentatis. Floribus minimis . . . Rachi, pedunculis calycibusque parce glanduloso-pilosis. Corollis rubellis calycem aequantibus. Calycis laciniis . . . oblongis obtusiusculis." This is a good account of *V. aquatica* Bernh.; and Schuster, as well as Römpp, placed *V. salina* in the unquestioned synonymy of *V. aquatica*. So far as I can make out the earliest clear and valid name for *V. aquatica* Bernh. (later homonym) is *V. salina* Schur. There are doubtless those who will champion the very vague *V. tenerrima* and the untypified and inaccurately described *V. connata* as against the clearly described and well understood *V. salina*. Personally I prefer a basis of some security rather than one of perpetual insecurity. Until it is shown that I am in error (and this note will call forward corrections if they are needed) I am taking up V. SALINA Schur for the illegitimate *V. aquatica* Bernh.

Typical *Veronica salina* was the form with more or less glandular inflorescence. It includes the following named forms:

V. SALINA Schur, Enum. Pl. Transsyl. 492 (1866). *V. Anagallis*, var. *glandulifera* Čelak. in Oest. Bot. Zeitschr. xxvii. 165 (1877). *V. aquatica*, forma *glandulifera* (Čelak.) G. Beck, Fl. Nied.-Österr. ii. 1051 (1893). *V. Anagallis-aquatica*, var. *glandulosa* Farwell in Rep. Mich. Acad. Sci. xix. 249 (1917). *V. catenata glandulosa* (Farwell) Pennell in RHODORA, xxiii. 37 (1921). *V. connata typica* sensu Pennell, Acad. Nat. Sci. Phila. Mon. i. 365 (1935), perhaps not *V. connata* Raf. (1830) which was described as glabrous and with perfoliate and entire leaves.

The wholly glabrous form is

V. SALINA Schur, forma **laevipes** (G. Beck), comb. nov. *V. aquatica* Bernh. Über Beg. Pflanzen Art. 66 (1834), not S. F. Gray (1821). *V. aquatica*, forma *laevipes* G. Beck., Fl. Nied.-Österr. 1051 (1893). *V. catenata* Pennell in RHODORA, xxiii. 37 (1921). *V. connata glaberrima* Pennell, Acad. Nat. Sci. Phila. Mem. i. 368 (1935).

Photo. W. H. Hodge

VERONICA SALINA, forma LAEVIPES (*V. catenata*): FIG. 1, branch, × 1, from California; FIG. 2, branch, × 1, from Bavaria.

Photo. W. H. Hodge

VERONICA SALINA (*V. catenata*, subsp. *glandulosa*) and forma LAEVIPES (*V. catenata*): FIG. 1, branch of slightly glandular plant, × 1, from Indiana; FIG. 2, branch, × 1, from Austria; FIG. 3, fruit, × 8, from South Dakota; FIG. 4, fruit, × 8, from Austria.

EXPLANATION OF PLATES 580–583.

PLATE 580. VERONICA ANAGALLIS-AQUATICA L., forma ANAGALLIFORMIS (Boreau) G. Beck (*V. glandifera* Pennell): FIG. 1, branch, × 1, of *V. glandifera* (det. *Pennell*) from near Williamsburg, Virginia, *Grimes*, no. 4587; FIG. 2, young branch, × 1, from Stradbally, Queens County, Ireland, *John Ball;* FIG. 3, fruit, × 8, of *V. glandifera* from near Williamsburg, Virginia, *Fernald & Long*, no. 8847; FIG. 4, fruit, × 8, from Newbridge Mt. Bellew, Galway, Ireland, July 17, 1906, *Bowers;* FIG. 5, fruit, × 8, from *V. glandifera* (det. *Pennell*), from Round Top Mountain, Smyth Co., Virginia, alt. 3000 ft., July 2, 1892, *J. K. Small;* FIG. 6, fruit, × 8, from entre Marin et Thielle, Switzerland, *Godet.*

PLATE 581. VERONICA ANAGALLIS-AQUATICA L.: FIG. 3, fruit, × 8, from fossis propre pagum Fratta, Venetia, *Pampanini* in Fl. Ital. Exsicc., no. 149; V. ANAGALLIS-AQUATICA, forma ANAGALLIFORMIS (Boreau) G. Beck: FIG. 1, branch of *V. glandifera* from Eastover, Virginia, *Fernald & Long*, no. 8845; FIG. 2, tip of branch from Gotland, Sweden, July 25, 1924, *T. M. Fries;* FIG. 4, fruit, × 8, of *V. glandifera* from Round Top Mt., Smyth Co., Virginia, July 2, 1892, *J. K. Small;* FIG. 5, fruit, × 8, from Sweden (same specimen as FIG. 2); FIG. 6, fruit, × 8, of *V. glandifera*, from type-locality, near Suffolk, Virginia, *Fernald & Long*, no. 8846.

PLATE 582. VERONICA SALINA Schur, forma LAEVIPES (G. Beck) Fernald (*V. aquatica* Bernh., forma *laevipes* G. Beck; *V. catenata* Pennell): FIG. 1, branch, × 1, of *V. catenata* (det. *Pennell*), from Alviso, Santa Clara County, California, *C. F. Baker*, no. 1700; FIG. 2, branch, × 1, of *V. salina*, forma *laevipes* from Bavaria, *Fl. Exsicc. Bav.* no. 460.

PLATE 583. VERONICA SALINA (*V. catenata*, subsp. *glandulosa* (Farw.) Pennell) and forma LAEVIPES (*V. catenata* Pennell): FIG. 1, branch, × 1, of *V. catenata* subsp. *glandulosa* (det. *Pennell*) from Starke County, Indiana, *Deam*, no. 42,185; FIG. 2, branch, × 1, of *V. aquatica* Bernh. (not S. F. Gray) from Lower Austria, *Braun & Rechinger* in Fl. Exsicc. Austr.-Hung., no. 2620; FIG. 3, fruit, × 8, from Hot Springs, Fall River County, South Dakota, *E. J. Palmer*, no. 37,432; FIG. 4, fruit, × 8, of *V. aquatica* from same specimen as FIG. 2.

VERONICA DIDYMA Ten. PRINCE GEORGE COUNTY: weed in old yard by James River, City Point, no. 9779.

VERONICASTRUM VIRGINICUM (L.) Farwell. SUSSEX COUNTY: border of moist woods south of Stony Creek, no. 9142. GREENSVILLE COUNTY: rich deciduous woods by Metcalf Branch, east of Emporia, no. 9143.

Pennell, l. c., map 86, indicates no Atlantic Coastal Plain stations from south of New Jersey.

SEYMERIA CASSIOIDES (Walt.) Blake. To the original Virginian stations (in Isle of Wight and Greensville Counties) add others in SUSSEX and NANSEMOND COUNTIES (several nos.). See p. 485.

BUCHNERA AMERICANA L. To the single Coastal Plain Virginian station (in Prince George County) reported in 1937 add others in DINWIDDIE and GREENSVILLE COUNTIES (several nos.). See p. 469.

UTRICULARIA JUNCEA Vahl. GREENSVILLE COUNTY: shallow rill in sphagnous bog about 1 mile northeast of Dahlia, nos. 9149 and 9629.

Beautiful material, up to 5 dm. high. See pp. 472, 485.

U. VIRGATULA Barnhart. GREENSVILLE COUNTY: with the last, nos. 9435 and 9628. See MAP 12 and p. 485.

Much later and decidedly lower (0.7–2 dm. high) than the larger-flowered *U. juncea*, with which it grows.

RUELLIA STREPENS L. PRINCE GEORGE COUNTY: swampy woods, bottomland of Powell's Creek, Garsyville, nos. 8472, 8854. CHARLES CITY COUNTY: alluvial woods along James River, Harrison Point, no. 9150.

Our only Coastal Plain stations; but it was found by Grimes in James City County.

*DICLIPTERA BRACHIATA (Pursh) Spreng. SOUTHAMPTON COUNTY: wooded alluvial bottomland of Meherrin River, near Haley's Bridge, nos. 8474, 9437 and 9438.

A slight extension northward, Pursh's type having come from the Roanoke River in North Carolina. See p. 486.

*PLANTAGO INDICA L. (*P. arenaria* Waldst. & Kit.). CAROLINE COUNTY: railroad gravel southeast of Guinea, no. 9153. See p. 474.

*SHERARDIA ARVENSIS L. DINWIDDIE COUNTY: shaded argillaceous grassland south of Burgess Station, no. 10,030.

HOUSTONIA LONGIFOLIA Gaertn. Reaching the Coastal Plain in SURRY COUNTY: rich calcareous wooded gullies along James River, Eastover, no. 8859. SOUTHAMPTON COUNTY: rich mixed and deciduous woods near Nottoway River, above Carey Bridge, no. 10,432. See p. 466.

OLDENLANDIA BOSCII (DC.) Chapm. CHESTERFIELD COUNTY: margin of exsiccated old mill-pond in Swift Creek, Lakeview, no. 9439. See p. 477.

VIBURNUM AFFINE Bush, var. HYPOMALACUM Blake. AMELIA COUNTY: border of woods west of Ammon, no. 9155. See p. 474.

SPECULARIA BIFLORA (R. & P.) Fisch. & Meyer. Characteristic of fallow fields and roadsides. DINWIDDIE COUNTY: east of Burgess Station, no. 10,041; near Burgess Station, no. 10,042. SOUTHAMPTON COUNTY: Franklin, no. 10,044. GREENSVILLE COUNTY: north of Skipper's, no. 10,043. See p. 496.

CAMPANULA AMERICANA L. Rich calcareous wooded slopes, ravines and thickets along the James, SURRY COUNTY: Claremont Wharf, no. 9158; Sunken Meadow Beach, no. 9159; Eastover, no. 8860. See pp. 466, 475.

LOBELIA SIPHILITICA L. SURRY COUNTY: wet ditch at border of woods west of Claremont, no. 9160; along rills, slopes of gullies in rich beech woods 1½ miles north of Surry, no. 9444; damp rich deciduous woods 1½ miles east of Blizzard's Corners, no. 9445. See p. 475.

*LOBELIA PUBERULA Michx., forma **candida**, f. nov., corollis albidis.—VIRGINIA: wooded swamp about 2 miles southeast of Cleopus,

Nansemond County, October 15, 1938, *Fernald & Long*, no. 9631 (TYPE in Gray Herb.).

EUPATORIUM SESSILIFOLIUM L., var. VASEYI (Porter) Fern. & Grisc. DINWIDDIE COUNTY: dry clearings and borders of woods south of Burgess Station, no. 9169. SOUTHAMPTON COUNTY: dry sandy woods and thickets near Three Creek, Drewryville, no. 9170.

Notable occurrence on the Coastal Plain of a characteristic plant of the mountains. See p. 476 and MAP 11.

KUHNIA EUPATORIOIDES L. To the station already recorded add from PRINCE GEORGE COUNTY: border of dry woods northwest of Talpa, no. 9635.

*HETEROTHECA SUBAXILLARIS (Lam.) Britton & Rusby. ISLE OF WIGHT COUNTY: dry sandy roadside and waste places, Lee's Mill, no. 8873.

Apparently the first from between North Carolina and Maryland. See p. 469.

*SOLIDAGO BICOLOR L., var. OVALIS Farwell. NORTHAMPTON COUNTY: dry sandy pine woods, Eastville, no. 5506. NANSEMOND COUNTY: woods about 2 miles southeast of Cleopus, no. 9175; moist argillaceous pine and oak woods and clearings north of Factory Hill, no. 9637.

Described from Michigan, var. *ovalis* is represented in the Gray Herbarium from Indiana, Kentucky, Tennessee and West Virginia as well as from the Coastal Plain of Virginia.

SOLIDAGO JUNCEA Ait. Apparently unknown on the Coastal Plain of southeastern Virginia. Our southeastern station is in CAROLINE COUNTY: border of woods west of Guinea, no. 9176.

SOLIDAGO PINETORUM Small. Range extended westward into the outer Piedmont in AMELIA COUNTY (no. 9177) and CAROLINE COUNTY (no. 9178), and on the Coastal Plain northward to GLOUCESTER COUNTY (no. 8876). See pp. 467, 474.

SOLIDAGO SPECIOSA Nutt. NANSEMOND COUNTY: border of sandy woods, South Quay, no. 6714; dry sandy roadside thicket, South Quay, no. 9639.

Although collected (very immature) in August, 1936, *Solidago speciosa* has not been reported, for want of flowering material (now at hand, collected October 13, 1938). It is a species of the interior and on the Coastal Plain, within a few miles of extensive sandy pine barrens, far-isolated from the Blue Ridge, the only other region of Virginia and North Carolina represented in the Gray Herbarium. At the first cited station in Nansemond County it is a close neighbor of *Carphephorus bellidifolius!*

*S. Elliottii T. & G. Henrico County: sphagnous springy swale bordering Whiteoak Swamp, west of Elko Station, nos. 9179, 9461. As noted on pp. 473 and 478 this is the southeastern typical form of the species, new to Virginia.

S. graminifolia (L.) Salisb., var. Nuttallii (Greene) Fernald. Local range extended south to Greensville County: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 9467.

Aster spectabilis Ait., var. suffultus Fernald in Rhodora, xxxviii. 447, plates 451 and 452. Described from Hampton, now found southward into North Carolina.[1] Sussex County: border of pineland northwest of Wakefield, no. 8880. Nansemond County: border of dry woods about 2 miles southeast of Cleopus, no. 9189.

A. grandiflorus L. Very precocious colony in Dinwiddie County: dry clearings and borders of woods south of Burgess Station, July 16, 1938, no. 8884; also in Brunswick County: dry upper border of argillaceous swale about 5 miles east of Edgerton, July 18, 1938, no. 8885.

Ordinarily *Aster grandiflorus* is the latest-flowering species of the genus, its splendid rich purple-violet heads expanding in October. The two colonies of plants flowering in July are most precocious. As usual, *A. grandiflorus* in 1938 generally began flowering in October.

A. laevis L. York County: wooded bank, York River, northwest of Yorktown, no. 7682.

Our only Coastal Plain station; not seen by Grimes.

*A. dumosus L. Greensville County: sphagnous bog about 1 mile northwest of Dahlia, no. 9473.

Wiegand, in Rhodora, xxx. 165 (1928), cites typical *A. dumosus* (the abundant plant of eastern Virginia is var. *coridifolius* (Michx.) T. & G.) only from southern Maine to New Jersey and southeastern Pennsylvania, with an isolated area on the Blue Ridge of North Carolina.

*A. dumosus, var. subulaefolius Torr. & Gray. Greensville County: with the last, no. 8886.

Wiegand, l. c. 168, had seen the variety (originally from Louisiana) from two areas: southeastern Massachusetts and southern Rhode Island; South Carolina to Florida, thence to Texas.

A. infirmus Michx. Henrico County: dry oak woods and clearings bordering Whiteoak Swamp, west of Elko Station, no. 9475.

Our first station on the Coastal Plain, but once found by Grimes in James City County.

[1] North Carolina: border of moist argillaceous pine and oak woods 1½ miles northeast of Dort School, Gates County, no. 9643. See p. 487.

ACANTHOSPERMUM AUSTRALE (Loefl.) Ktze. To the station long ago reported by Harper add one from GREENSVILLE COUNTY: sandy railroad embankment south of Skipper's, no. 9651.

*SILPHIUM ATROPURPUREUM Retz., forma **hirticaule**, f. nov., caule hispido.—Greensville County, VIRGINIA: mixed with the typical glabrous-stemmed plant, border of rich woods near Metcalf Branch, north of Emporia, August 20, 1938, *Fernald & Long*, no. 9199.

IVA FRUTESCENS L. Extends up the James at least to SURRY COUNTY: sandy beach of James River at mouth of Crouch Creek, east of Scotland, no. 9476.

RUDBECKIA TRILOBA L. Local on the Coastal Plain. PRINCE GEORGE COUNTY: wooded slope near Bailey's Creek, east of Hopewell, no. 9204. SURRY COUNTY: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, nos. 8502 and 9205. GREENSVILLE COUNTY: bottomland woods along Metcalf (on the label erroneously called Caney) Branch, east of Emporia, *Fernald, Griscom & Long*, no. 6727.

R. FULGIDA Ait. To the single Coastal Plain record (Williamsburg) published by Mrs. Erlanson add the following. CHESTERFIELD COUNTY: exsiccated swale northeast of Colonial Heights, no. 9478. SUSSEX COUNTY: border of moist woods south of Stony Creek, no. 9206; thicket bordering pineland about 2 miles east of Stony Creek, no. 9652; damp woods bordering Assamoosick Swamp, about 2 miles northeast of Homeville, no. 9207; damp pine and oak woods and thickets north of Jarratt, no. 9479. GREENSVILLE COUNTY: Emporia, September 22, 1913, *Tidestrom*, no. 6919. See p. 475.

*HELIANTHUS CUCUMERIFOLIUS Torr. & Gray. ISLE OF WIGHT COUNTY: dry sandy roadsides and waste places, Lee's Mill, no. 8897.

Escape from cultivation; native of the Gulf States.

COREOPSIS TRIPTERIS L. A plant primarily of the interior of the continent, found locally on the Coastal Plain. SUSSEX COUNTY: border of moist woods south of Stony Creek, no. 9217; exsiccated argillaceous pineland about 2 miles east of Stony Creek, no. 9221; damp woods bordering Assamoosick Swamp, about 2 miles northeast of Homeville, no. 9222. GREENSVILLE COUNTY: border of rich deciduous woods (just at the Fall Line) by Three Creek, north of Emporia, no. 9219. SOUTHAMPTON COUNTY: border of swampy woods about 1 mile northeast of Branchville, no. 9218. Also at the eastern border of the Piedmont: AMELIA COUNTY (boggy swale, Otterburn, about 1 mile west of Amelia Courthouse, no. 9216) and in CAROLINE COUNTY (border of woods west of Guinea, no. 9220). See p. 475.

Search through the geographically unorganized citations by Sherff fails to find any material cited from Virginia.

BIDENS CORONATA L., var. TRICHOSPERMA (Michx.) Fernald. See RHODORA, xl. 350, pl. 506, figs. 8 and 9 (1938). A very extensive

station in SURRY COUNTY: tidal marsh at mouth of Crouch Creek, east of Scotland, nos. 9486 and 9658.

B. COMOSA (Gray) Wiegand. HENRICO COUNTY: field behind Stadium, University of Richmond, September 28, 1934, *M. Ellyson & C. Puette* (as *Solidago squarrosa*!, marked "common," this, in view of the misidentification, perhaps to be questioned); swampy thicket bordering Whiteoak Swamp, south of Elko Station, no. 9485. See p. 478.

A fifteen-minute search of the geographically unorganized stations cited by Sherff reveals no Virginian station in the southeastern counties.

HELENIUM NUDIFLORUM Nutt. SURRY COUNTY: border of roadside ditch west of Surry, no. 10,845. GREENSVILLE COUNTY: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 8511; pastured field northeast of Emporia, no. 10,451.

*H. BREVIFOLIUM (Nutt.) Gray. GREENSVILLE COUNTY: along a seepy old woodroad north of Dahlia, no. 10,051.

First from north of North Carolina. See p. 491.

ARTEMISIA ANNUA L. GREENSVILLE COUNTY: railroad yard, North Emporia, no. 9487.

SENECIO OBOVATUS Muhl. SURRY COUNTY: rich alluvial woods and thickets back of sand-beach of James River, Eastover, no. 8901. See p. 466.

CIRSIUM NUTTALLII DC. To the single known station in the state add another, also in SOUTHAMPTON COUNTY: exsiccated swampy woods about 1 mile southwest of Branchville, no. 9224.

CHONDRILLA JUNCEA L. Range extended southward from the northern part of the state to CAROLINE COUNTY: sandy open slope, north of Golansville, no. 9225. DINWIDDIE COUNTY: cinders of freight-yard, Norfolk and Western Railroad, Petersburg, no. 10,847.

*LACTUCA CANADENSIS L., var. LATIFOLIA Ktze., forma **villicaulis** f. nov., caulibus villosis.—VIRGINIA: abundant with the glabrous plant, clearing west of Burgess Station, Dinwiddie County, July 16, 1938, *Fernald & Long*, no. 8903 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.); sandy roadside thicket south of Reams, Dinwiddie County, July 14, 1938, *Fernald & Long*, no. 8902; swampy woods about 1 mile west of Skipper's, Greensville County, September 18, 1938, *Fernald & Long*, no. 9490.

PRENANTHES AUTUMNALIS × SERPENTARIA. A small group of very large plants with a clear combination of the characters of the two common species, in NANSEMOND COUNTY: seeping bank of ditch at margin of woods, about 2 miles southeast of Cleopus, no. 9661.

P. ALTISSIMA L. SURRY COUNTY: slopes of gullies in rich woods 1½ miles north of Surry, no. 9491.

A Coastal Plain station for a northern and montane species. See p. 477.

SILENE CAROLINIANA

Robert T. Clausen

(Plate 584)

The necessity of verifying the name of a cultivated plant, received as *Silene Wherryi* Small, has led to a review of the relationships of that species to *Silene caroliniana* Walter and *S. pensylvanica* Michaux. A survey of the literature indicates that no author has discussed the status of *S. Wherryi* since it was described by Small (1926), while the matter of the proper designation for the Wild Pink of the northeastern states was left unsettled by Weatherby and Griscom (1934).

In the present study, the writer has examined all of the material, representing the three names involved, available in the following institutions: Bailey Hortorium, Cornell University (BH); Brooklyn Botanic Garden (Bk); herbarium of the Department of Botany, Cornell University (Corn); herbarium of Duke University (Duke); Gray Herbarium, Harvard University (G); herbarium of the University of Michigan (Mich); Missouri Botanical Garden (M); New York Botanical Garden (NY); Academy of Natural Sciences of Philadelphia (Ph); and United States National Herbarium (US). He is indebted to the officers of these several institutions for the privilege of borrowing and studying their specimens. He also wishes to express his appreciation to Mr. C. A. Weatherby and to Mr. C. C. Deam for various helps and courtesies.

The conclusions reached here represent the result of looking over somewhat more than two hundred herbarium sheets. With the exception of four sheets which were designated as hybrids, all were originally labelled with a binomial name, as either *S. caroliniana*, *S. pensylvanica*, or *S. Wherryi*. Despite the fact that the same collection might bear a different name in each of three herbaria, indicating confusion and possible intergradation, no varietal names appear on any of the sheets, nor does it appear that any varietal combinations have ever been made. From available herbarium material, it was evident that identifications of Wild Pinks have been made in the most arbitrary fashion and that the differences between the three so-called species had never been properly elucidated.

As a preliminary attempt to clear the confusion, the original descriptions of the three names were consulted. On a basis of these diagnoses, a tentative key was prepared. The descriptions were full

enough to permit this. *Silene caroliniana* was said to have tomentose obtuse basal leaves, *S. pensylvanica* was described as viscid-pubescent with lanceolate leaves, while *S. Wherryi* was differentiated by the non-glandular hairs of the calyx and other characters. Study of the type of *S. Wherryi* and of specimens from Pennsylvania and South Carolina, which seemed to agree with the descriptions of the other two species, further helped to indicate the proper interpretation of the three names. With this preparation and completely disregarding geographical data on labels, all specimens were run through the key and sorted into three piles. The result was amazing. Plants in the pile for *S. pensylvanica* were from southern New Hampshire and Massachusetts south to northern North Carolina and west to eastern Ohio and northeastern Tennessee; those in the pile for *S. caroliniana* were from southern North Carolina, South Carolina, and Georgia; and those in the pile for *S. Wherryi* were from southern Ohio, Kentucky, Missouri, and Alabama. There were only two difficulties to spoil this picture. One was a pile of five sheets which would not fit the key at all—and for good reasons; one represented *Phlox subulata* and the other four *Silene virginica*. The other difficulty consisted of a small pile of sheets representing specimens which seemed to bridge the two gaps which should exist if the three names under discussion really represent species. Occasional specimens from Virginia and Maryland, which seemed more like *S. pensylvanica*, also somewhat suggested *S. caroliniana*. Likewise, certain specimens from West Virginia and western Virginia seemed to be intermediate between *S. Wherryi* and *S. pensylvanica*. Unfortunately, the areas where one would expect intermediates to occur were mostly deadspots. There was little available material from North Carolina or from the parts of Ohio, Kentucky, and Tennessee in which one might be interested. Yet, the facts as determined from this little survey seem rather definite and at the same time different from the interpretation of contemporary collectors who have used one of the three available binomials and perhaps have not much considered the problem involved.

For a long time, the Wild Pinks of the Atlantic Coastal Plain and of the Mississippi valley were considered the same. Superficially the plants from the two regions appear similar. It was not until the critical field-student, Prof. E. T. Wherry, and Dr. J. K. Small attacked the problem that the differences between the populations were

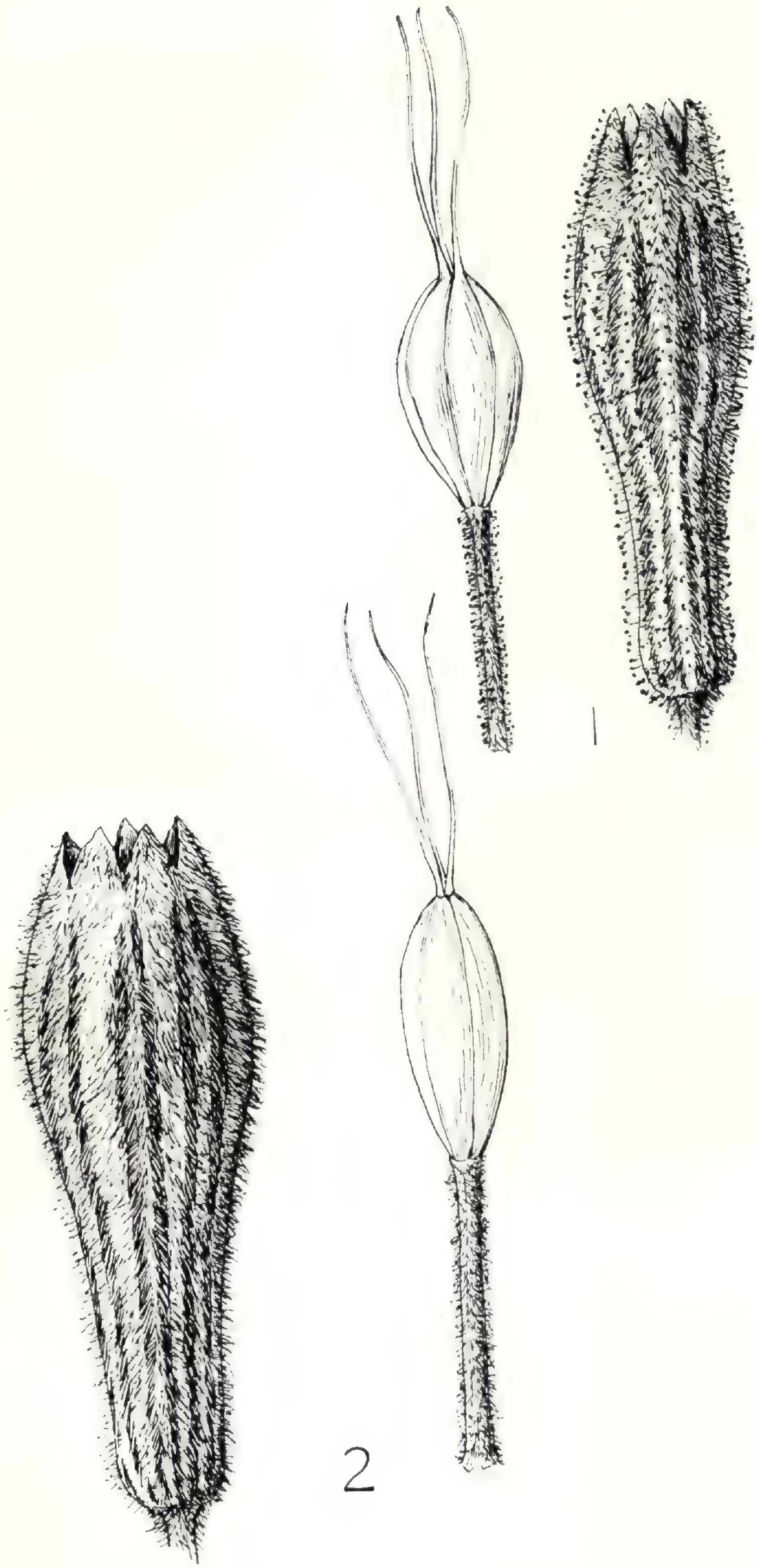
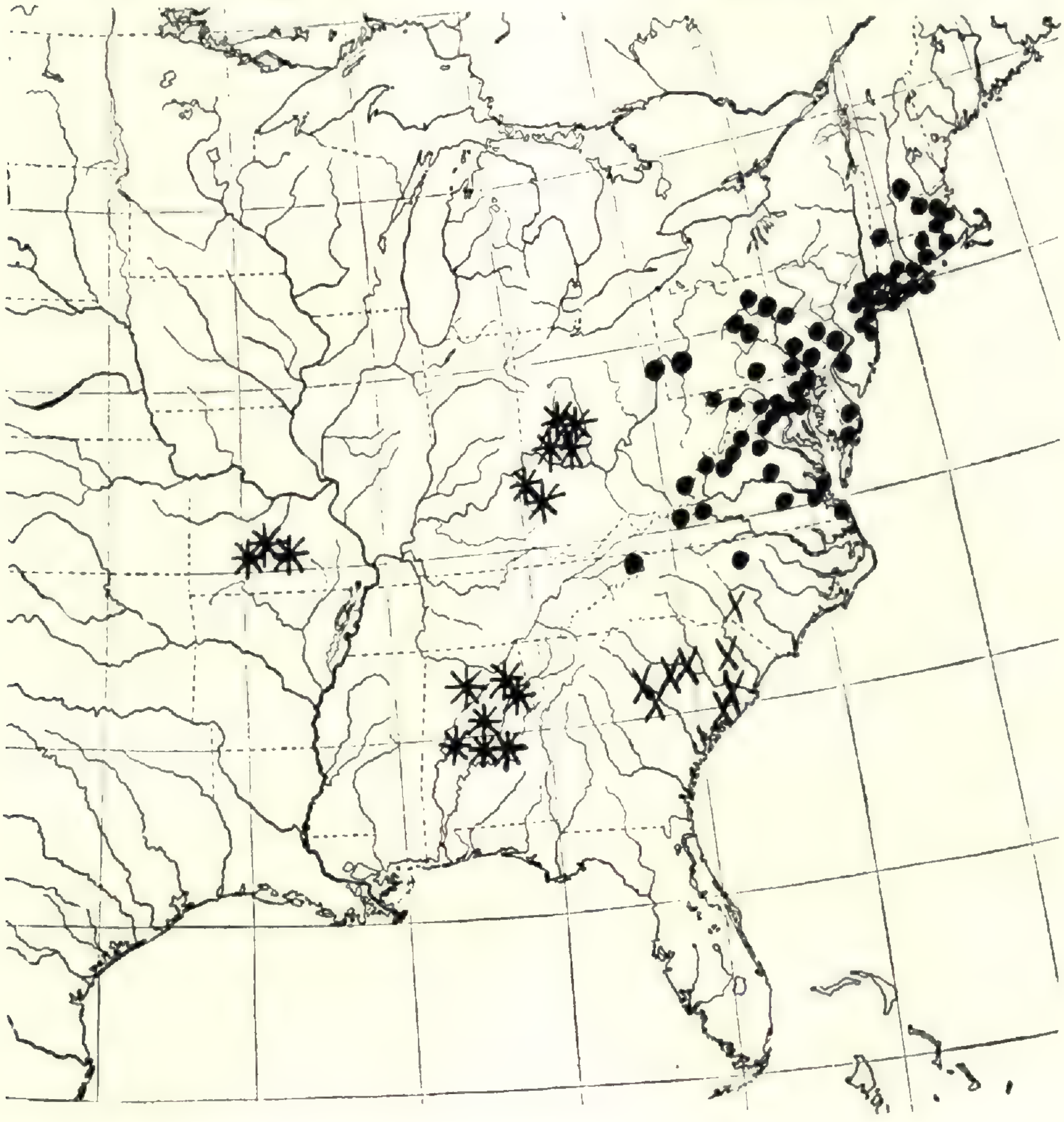


FIG. 1, pistil and calyx of SILENE CAROLINIANA ssp. PENSYLVANICA, × 4.7; FIG. 2, pistil and calyx af S. PENSYLVANICA ssp. WHERRYI, × 4.7.

noticed. Today these differences are at once apparent to the trained eye; but, since the untrained eye still will think of the whole complex as one species, while intermediates do occur, indicating continuity in the series, it seems better to interpret these technical differences as



Map 1. Range of SILENE CAROLINIANA ssp. TYPICA (×), of ssp. PENSYLVANICA (●), and of ssp. WHERRYI (*).

representing geographical races or subspecies, not full species. Data are not today available to indicate whether these races represent populations diverging from a common ancestor or populations coming together, nor is there any cytological evidence to permit theorizing. The writer can only state what he knows from observation: that there are three decided morphological tendencies in the Wild Pinks; that

these are very strongly correlated with geographical range; and that occasional intermediates between the three tendencies do occur. As the proper name for this aggregate species, that of Walter, *S. caroliniana*, which is the oldest, must be employed.

Silene caroliniana Walter, *sensu latiore*, may now be characterized as a perennial herb with a stout caudex, 4–32 cm. high, with a rosette of basal leaves varying from narrowly oblanceolate and acute to broadly oblong-spatulate and blunt, either glabrous on both surfaces or rather densely pubescent, always ciliate, tapering into hairy petioles; stems and cauline leaves puberulent or pubescent with glandular or eglandular hairs; cauline leaves linear-oblong, lanceolate, or ovate; inflorescence cymose with the flowers short-stalked; calyx narrowly or broadly tubular, with the pubescence glandular or eglandular; petals pale or dark pink, slightly notched, with the claws equaling or exceeding the calyx; stamens 10; styles 3, equaling or exceeding the ovary.

Key to the subspecies of Silene caroliniana

A. Rosette-leaves oblong-spatulate, rarely oblanceolate, blunt or rarely mucronate, 0.5–3.0 cm. broad, rather densely pubescent on both surfaces and on margins with short white hairs . . . . . a. *Silene caroliniana* ssp. *typica*.

AA. Rosette-leaves oblanceolate, elliptic-lanceolate, or rarely spatulate, mostly acute or rarely blunt, 0.1–2.0 cm. broad, glabrous on both surfaces, ciliate . . . . B.

B. Calyx narrowly tubular, densely glandular-pubescent; claws of petals slightly exceeding the calyx . . . . . b. *Silene caroliniana* ssp. *pensylvanica*.

BB. Calyx broadly tubular, densely pubescent or puberulent with white eglandular hairs; claws of petals usually equaling or rarely exceeding the calyx . . . . . c. *Silene caroliniana* ssp. *Wherryi*.

Silene caroliniana Walter, ssp. **typica**. *S. caroliniana* Walter, Flora Caroliniana, p. 142 (err. typ. 241). 1788. In the absence of an authentic type specimen annotated by Walter himself, the species is best interpreted from the original description: "*Silene caroliniana* floribus magnis, petalis obtusis, calycibus cylindricis, panicula subtrichotoma; foliis radicalibus tomentosis obtusis, caulinis oppositis acutioribus. Varietates. Petalis supra coccineis, subtus incarnatis; et petalis utrinque incarnatis."—Perennial, 7–20 cm. high; rosette-leaves oblong-spatulate, rarely oblanceolate, blunt or rarely mucronate, 3–12 cm. long, 0.5–3.0 cm. broad, rather densely pubescent on both surfaces and on margins with short white hairs; stalks 4–19 cm. long, puberulent to hirsute, with hairs glandular towards upper portion of stems; cauline leaves linear-oblong, acute at apex, 1.3–4.8 cm. long, 0.2–0.8 cm. broad; inflorescence cymose; calyx narrowly tubular, 1.5–1.7 cm. long, densely glandular-pubescent; petal-blades 0.8–1.3 cm. long, with claws slightly exceeding calyx.

Weatherby and Griscom (1934) have pointed out the distinctive characters of this population: pubescent with long matted hairs; radical leaves oblanceolate to broadly obovate, obtuse or mucronulate; petals white or tinged with pink; teeth of the glandular-viscid calyx red. Weatherby's collection, no. 6114, from dry open mixed woods south of the Congaree River opposite Columbia, may well be taken as representative of the plant described by Walter.

In a letter to the writer, Mr. Weatherby has furnished a description and details concerning a specimen[1] in the Walter herbarium at the British Museum. The original label reads "Silene an virginica ?", but some one has written on the page in pencil, "*S. caroliniana* Walter." The description furnished by Mr. Weatherby indicates that the basal leaves of this specimen are oblanceolate and acutish and that the pubescence is most nearly matched by a collection from near Hazelgreen, Laclede Co., Missouri, *E. J. Palmer 39198*, but the calyx is more slender and the flowers are smaller than in the Palmer specimens. Since the Missouri plants represent *Silene Wherryi* Small, which is characterized by the broad tubular calyx, the specimen at the British Museum is probably not to be referred to that. Further, if the basal leaves of the supposed type are oblanceolate and acutish, with pubescence as in the Palmer specimens, then Walter's description, which definitely states that the basal leaves are tomentose and obtuse, does not check with the specimen that he supposedly gave to Fraser. Of twelve collections, some of them represented in several herbaria, from South Carolina and Georgia, all agree with the description in the Flora Caroliniana. In view of this situation it seems better to interpret Walter's species, not by the specimen in the British Museum, but in accordance with the original description and the series of specimens at hand from South Carolina and Georgia.

The ssp. *typica* is a plant of sandy open woods, dry sandy pine lands, and rocky woods. It flowers from late March through April. The range includes the coastal plain and lower piedmont province of southern North Carolina, South Carolina, and Georgia. NORTH CAROLINA. Richmond Co.: Hamlet, *C. S. Williamson* (Ph). SOUTH CAROLINA. Aiken Co.: Warrenville, *E. J. Palmer 39882* (G). Berkeley Co.: Santee Canal, *H. W. Ravenel* (G). Darlington Co.: Darlington, *L. F. Ward* (NY, US). Dorchester Co.: Summerville, *H. H.*

[1] Since this manuscript was submitted for publication, the writer has received, through the kindness of Mr. A. H. G. Alston of the British Museum (Natural History), a photograph of the specimen of *Silene caroliniana* in the Walter herbarium. Study of this photograph necessitates no changes in the above text.

Rusby (NY). Lexington Co.: Columbia, *C. A. Weatherby 6114* (Duke, G, NY, US). Richland Co.: Columbia, *K. A. Taylor* (Mich). Also near Ashley River, *B. L. Robinson 58* (G) and without specific locality, *L. R. Gibbes* (US). Georgia. Burke Co.: bank of Rocky Creek, Waynesboro, *R. M. Harper 2075* (G, M, NY, US). Richmond Co.: Augusta, *S. T. Olney & J. Metcalf 17* (G). Also other specimens without complete data.

Silene caroliniana ssp. **pensylvanica** (Michx.), n. comb. Figure 1. *S. pensylvanica* Michx., Flor. Bor.-Am. **1**: 272. 1803. The writer has formed his concept of this species from the original description: "S. viscido-pubens: foliis cuneatis, caulinis lanceolatis: cauliculis in summitate paucifloris: petalis leviter emarginatis, subcrenatis. *Obs.* Affinis *S. Virginicae:* humilis, cauliculis simpliciusculis: petala obtusissima, purpurascentia. *Hab.* in Pensylvania."

Perennial, 4–30 cm. high; rosette-leaves oblanceolate or rarely spatulate, mostly acute or rarely blunt, 1–15 cm. long, 0.1–2.0 cm. broad, glabrous on both surfaces, ciliate; stem glandular-pubescent above cauline leaves; cauline leaves opposite, lanceolate, ovate, or elliptical, acute or blunt, 1–7 cm. long, 0.2–0.8 cm. broad; inflorescence cymose; calyx (1.0) 1.3–1.8 cm. long, narrowly tubular, densely glandular-pubescent; petals pink, with the blades 0.8–1.5 cm. long and the claws usually slightly exceeding the calyx.

Occasional specimens from Virginia and Maryland are intermediate between this and the preceding subspecies. These have blunt rosette leaves, but the pubescence is more like that in the northern subspecies than in ssp. *typica*.

The nomenclatorial absurdity resulting from the name *Silene caroliniana* ssp. *pensylvanica* is regrettable, but seems unavoidable. Such an example, and others, like *Cercis canadensis* and *Asclepias syriaca*, serve to demonstrate that geographical descriptive adjectives for specific names may lead to confusion.

Although *Silene caroliniana* is offered in the horticultural trade by several nurserymen, no specimens of ssp. *typica* have been seen by the writer. Specimens under that name have been ssp. *pensylvanica*. Plants offered as *S. pensylvanica* represent the northern race.

The ssp. *pensylvanica* is a plant of dry open woods, gravelly banks, and rocky places. It flowers mostly in May and early June, although in Virginia the flowering period begins in April. The range extends from southern New Hampshire and Massachusetts south through southern New York and northern New Jersey to southern Virginia and northern North Carolina, and west through central and western Pennsylvania to eastern Ohio and extreme northeastern Tennessee.—New Hampshire. Cheshire Co.: Alstead, ———— (M 148015). Massachusetts. Berkshire Co.: Mount Washington, *C. H. Knowlton*

and *C. Schweinfurth* (M, Ph). Middlesex Co.: Framingham, *A. J. Eames* (Corn). Norfolk Co.: Norfolk, *Thomas Morong* (M, NY). RHODE ISLAND. Warwick Co.: Warwick, *J. W. Congdon* (NY). CONNECTICUT. Fairfield Co.: Greenwich, *Lizzie Churchill 665* (M). New Haven Co.: Milford, *E. H. Eames* (US). New London Co.: Franklin, *R. W. Woodward* (G). Windham Co.: Scotland, *C. H. Bissell* (G). NEW YORK. Bronx Co.: Bronx Park, *G. V. Nash 113* (NY). Manhattan Co.: New York, ———— (M 148007). Nassau Co.: Westbury, *Helen Hicks* (G). Queens Co.: Jamaica, *F. C. Stewart* (Corn). Richmond Co.: Grant City, *F. W. Pennell 9947* (Ph). Suffolk Co.: Southampton, *W. N. Clute 30* (NY). Westchester Co.: Ossining, *P. B. Schumm* & *A. Gershoy* (Corn). NEW JERSEY. Bergen Co.: Alpine, *A. Gershoy* (Corn). Gloucester Co.: Westville, *C. S. Williamson* (Ph). Hudson Co.: Snake Hill, *G. B. Branin* (Bk). Middlesex Co.: South River, *K. K. Mackenzie 3978* (M, US). Monmouth Co.: Freehold, ex herb. *O. R. Willis* (Mich). Passaic Co: Wanaque, *Ludlow Griscom 1200* (G). PENNSYLVANIA. Allegheny Co.: Moon Tp., *J. A. Shafer 192* (Corn). Blair Co.: Birmingham, *Miss Davis* (Mich). Centre Co.: ————, *J. T. Rothrock* (G). Columbia Co.: Knob Mountain, *W. H. Harrison* (Ph). Dauphin Co.: Harrisburg, *F. S. Chapman 6843* (Duke). Franklin Co.: Mt. Alto, *Jos. Illick* (M). Lancaster Co.: Chestnut Hill, *J. K. Small* (NY). Lebanon Co.: Jonestown, *H. W. Pretz 8098* (Ph). Lycoming Co.: between Jersey Shore and Waterville, *K. M. Wiegand* (Corn). Mifflin Co.: Rawlinsville, *J. Galen* (BH). Montgomery Co.: Linfield, *B. Long 11644* (G). Montour Co.: Danville, *H. B. Meredith* (Ph). Perry Co.: ————, *L. L. Smith* (Ph). Schuylkill Co.: McKeansburg, *K. M. Wiegand* (Corn). York Co.: Glen Rock, *W. M. Glatfelter* (M 148009). DELAWARE. Sussex Co.: Millsboro, *A. Commons* (G, M, NY, Ph). MARYLAND. Baltimore Co.: Orange Grove, *C. C. Plitt 661* (G). Garrett Co.: Oakland, *J. D. Smith 402* (US). Howard Co.: Ellicott City, *Bro. Arsène 1407* (US). Montgomery Co.: Glen Echo, *C. L. Pollard 87* (US). Prince Georges Co.: Hyattsville, *P. C. Standley 13134* (US). Washington Co.: Harper's Ferry Heights, *S. Watson* (G). Worcester Co.: Snow Hill, *Mrs. Charles E. Moldenke 8427* (NY). DISTRICT OF COLUMBIA. Sandy Landing, *J. H. Comstock* (Corn). VIRGINIA. Augusta Co.: Shenandoah Valley, *Eleanor A. Friend 10427* (NY). Bath Co.: Nimrod Hall, *Lee Sowden* (Ph). Culpepper Co.: Waterloo, *H. B. Meredith* (Ph). Dinwiddie Co.: Petersburg, *E. T. Wherry* (US). Fairfax Co.: Great Falls, *A. H. Moore 5096* (G). Fauquier Co.: Bull Run Mts., *H. A. Allard 258* (G). Henrico Co.: Richmond, *J. R. Churchill* (G). James City Co.: Williamsburg, *E. J. Grimes 2563* (G). Loudoun Co.: Bluemont, *P. C. Standley 13153* (US). Montgomery Co.: Blacksburg, *W. A. Murrill* (NY). Princess Anne Co.: Creeds, *M. L. Fernald* & *L. Griscom 4390* (G). Roanoke Co.: Roanoke, *E. G. Britton* & *A. M. Vail* (NY). Rockbridge Co.: Buena Vista, *F. F. Huber* (Ph). Rockingham Co.: Mt. Crawford, *A. A.*

Heller 788 (G, M, NY, Ph, US). Surry Co.: Claremont Wharf, *M. L. Fernald & B. Long 7822* (G). West Virginia[1]. Greenbrier Co.: White Sulphur Springs, *W. W. Eggleston 4355* (G, M, NY). Hampshire Co.: Okonoko, *Wilbert Frye* (Duke). North Carolina. Franklin Co.: Bunn, *H. J. Oosting 1730* (Duke). Ohio. Jefferson Co.: Steubenville, *H. M. Mertz* (US). Tennessee. Carter Co.: Elizabethtown, *H. M. Jennison* (US). Hort. Lansing, Mich., *L. H. Bailey* (BH). Poughkeepsie, N. Y., *P. J. Van Melle* (BH).

Silene caroliniana ssp. **Wherryi** (Small), n. comb. Figure 2. *S. Wherryi* Small in Torreya **26**: 66. 1926. Based on material from Alabama and Kentucky. The writer has examined the type which is in the herbarium at the New York Botanical Garden. It is the collection of J. B. Hobdy, no. 11, from open woods on calcareous sandstone, Albertville, Marshall Co., Alabama. The species was named for Dr. E. T. Wherry, who first brought its distinctive characters to the attention of Dr. Small. Perennial, 8–32 cm. high; rosette-leaves elliptic-lanceolate, oblanceolate, or rarely oblong-spatulate, mostly acute, occasionally obtuse, 1.5–8.0 cm. long, 0.2–1.4 cm. broad, glabrous on both surfaces, ciliate; stem and cauline leaves pubescent; cauline leaves lanceolate, 1.5–9.0 cm. long, 0.3–0.8 cm. broad; inflorescence cymose; calyx broadly tubular, densely pubescent or puberulent with white eglandular hairs, 1.5–2.2 cm. long; petals with claws equaling or sometimes exceeding calyx, blades 1–1.4 cm. long, rounded or emarginate; style about as long as ovary.

Dr. Small originally distinguished his species by the calyx equaling the claws of the petals, densely pilose with non-glandular hairs, and the style about as long as the ovary. The writer has found the pubescence and the relative width of the calyx to be most satisfactory for separating this population from ssp. *pensylvanica*. Least satisfactory is the length of the calyx. In many plants of ssp. *pensylvanica*, this equals the claws of the petals. In that subspecies, the style is from 5–6 mm. and the ovary from 4–5 mm., while in ssp. *Wherryi* the style is from 5–8 mm. and the ovary from 6–8 mm. Not enough fresh material was available to make detailed measurements possible, but these figures are perhaps suggestive. The style and ovary are both somewhat larger in ssp. *Wherryi*, but of approximately the same relative length.

The writer regrets that he must reduce to subspecific rank a species named in honor of a respected contemporary botanist, but taxonomy permits no opportunity for sentiment. Specimens, such as some of those cited under the last subspecies from West Virginia and western

[1] The following record may be added under West Virginia. Mineral Co.: New Creek, *L. H. Bailey* (BH).

Virginia, while closer to ssp. *pensylvanica* than to the present race, yet are somewhat intermediate and indicate that the two populations can not be maintained as species.

The ssp. *Wherryi* is a plant of rocky upland woods, usually in calcareous regions, although it is sometimes found in slightly acid situations. The flowering period is from April through May. As at present known, the range is broken into three areas: southern Ohio and Kentucky, Missouri, and central and northern Alabama. OHIO. Adams Co.: ————————, *Conrad Roth* (G). Highland Co.: Brush Tp., *L. L. Pontius* & *F. Bartley* (US). Pike Co.: Byington, *E. T. Wherry* (NY). Scioto Co.: Rarden, *Delzie Demaree 10615* (NY, Ph). KENTUCKY. Fayette Co.: Lexington, *Robert Peter* (Mich). Franklin Co.: Frankfort, ———————— (G). Jassamine Co.: ————————, photo by E. T. Wherry (NY). MISSOURI. Dent Co.: between Howe and Iligo, *J. A. Steyermark 18694* (M). Laclede Co.: Hazelgreen, *E. J. Palmer 39198* (G, M, US). Phelps Co.: Jerome, *J. H. Kellogg* 21 (Corn, M, NY). Pulaski Co.: Hooker, *J. A. Steyermark 7776* (M, US). Shannon Co.: 3 miles south of Dent Co.—Shannon Co. line, *J. A. Steyermark 18922* (M). ALABAMA. Autauga Co.: between Booth and Autaugaville, *R. M. Harper 3028* (BH, G, M, NY, Ph). Bibb Co.: Centerville, *E. T. Wherry* (G, US). Cullman Co.: Cullman, *Mary* & *Emily Molar* (?). Elmore Co.: Wetumpka, *E. T. Wherry* (G, US). Etowah Co.: Gadsden, *T. L. Boynton* (US). Jefferson Co.: Birmingham, *E. J. Palmer 35313* (G, M). Marshall Co.: Albertville, *J. B. Hobdy 11* (NY, US). HORT. Harvard Botanical Garden, ———————— (G). T. M. Rock Garden, New York Botanical Garden, *K. Quinn* (BH).

From Shannon Co., Mo., the writer has seen two collections of *J. A. Steyermark*, nos. *18923* & *18924* (M) which seem to represent hybrids between *Silene virginica* L. and *S. caroliniana* ssp. *Wherryi*. According to the notes of the collector, these are natural hybrids occurring with the parent species.

S. caroliniana is perhaps most closely related to *S. virginica*. In separating the two species, the length of the petals, the color of the corolla, and the nature of the cauline leaves and calyx are more satisfactory than the furcation of the petals, since in *S. virginica* the petals are occasionally only slightly emarginate.

The above discussion represents what the writer, as a descriptive taxonomist, knows about the Wild Pinks. He hopes that cytologists and geneticists will now attack the problem. If the three populations designated as subspecies have different basic chromosome numbers or if they show a high degree of sterility when crossed with each other, the conclusions reached here may have to be changed.

Literature Cited

Small, J. K. 1926. A new catchfly from the southeastern states. Torreya. **26**: 65–67.

Weatherby, C. A. and **Griscom, L.** 1934. *Silene caroliniana* Walter, in notes on the spring flora of the coastal plain of South Carolina north of Georgetown. Rhodora. **36**: 53.

Bailey Hortorium
Cornell University
Ithaca, N. Y.

Chromosomes of Proserpinaca L.—This North American genus of *Halorrhagidaceae* appears to consist of three described species: *Proserpinaca palustris* L., *P. pectinata* Lam., and *P. intermedia* Mackenzie; Fernald and Griscom[1] recognize two varieties of *P. palustris*.

Fourteen somatic chromosomes in root-tip smears of Proserpinaca palustris (fig. 1), of P. pectinata (fig. 2), of P. intermedia (fig. 3). All × 4500.

In a letter of August 15, 1939, Professor Fernald wrote: "In an account of the past year's work which is now going to the printer I specially refer to a pool not far from Lee Hall on the road from Yorktown to Williamsburg, full of *Proserpinaca pectinata*, *P. palustris* and *P. intermedia*, the latter sometimes thought to be a fertile hybrid. I call attention to this and to the beautiful opportunity to study the situation cytologically." Accordingly, on August 21, from a ditch by Route 170, about halfway between Lee Hall and Yorktown, Virginia, the writer collected specimens of the three species (Baldwin 421, 422, and 423). Root-tip smears showed each of the species to have 14 somatic chromosomes (Figs. 1, 2, and 3).—J. T. Baldwin, Jr., Department of Botany, University of Michigan.

[1] Fernald and Griscom, Rhodora **37**: 167–189. 1935.

Some Newly Described Forms from Missouri.—Types of the following are deposited in the Herbarium of Field Museum of Natural History and isotypes in the Missouri Botanical Garden.

Psoralea tenuiflora Pursh, f. **alba**, f. nov., petalis albis.—Limestone glade on top of east-facing bluffs along Osage River, T40N, R23W, Sect. 13, 2½ miles west of Warsaw, Benton County, June 3, 1938, *J. A. Steyermark 5779* (type).

Hypericum pseudomaculatum Mack. & Bush, f. **flavidum**, f. nov., corolla filamentibusque pallidis lacteo-luteis.—Open rocky, cherty barren slopes along Mill Creek, 5 miles southeast of Pineville, McDonald County, May 31, 1938, *J. A. Steyermark 5606* (type).

The pale creamy-yellow corolla and filaments distinguish this form from the normal orange-yellow type.

Ruellia caroliniensis (Walt.) Steudel, f. **alba**, f. nov., corolla alba.—Prairie slopes above limestone bluffs along Long Creek, 1½ miles south of Kingston, Caldwell County, June 23, 1938, *J. A. Steyermark 6058* (type).

Houstonia pusilla Schoepf, f. **rosea**, f. nov., corolla rosea vel carmesina.—Along road D, in Sect. 8, 4 mi. west of Jerome, Pulaski County, April 17, 1937, *J. A. Steyermark 4599a* (type).

The color of the corolla in this form varies from rose to carmine.

Cirsium altissimum normally has heads of rose-colored or purplish corollas. An albino form, with the corollas of the heads pure white, has recently been collected by Mr. George Moore of Lebanon, Missouri. Mr. Moore has long been active in studying and collecting the native flora of Laclede County, and it is a pleasure to name this form of *Cirsium altissimum* in his honor. The plant may be called

Cirsium altissimum (L.) Spreng., f. **Moorei**, f. nov., corollis albidis.—Mill Creek, Laclede County, Missouri, August 25, 1939, *Geo. Moore*.—Julian A. Steyermark, Field Museum of Natural History.

Volume 41, no. 491, including pages 521–560 and plates 574–579, was issued 31 October, 1939.

ERRATA

Page 8, line 30; for *Graeffiana* read *Graeffeana.*
Page 44, line 20; for *hyalino* read *hyalino-.*
Page 107, in second column, line 36; for *macrorhiza* read *macrorrhiza.*
Page 142, line 3; *for* 461–464 *read* 551–554.
Page 147, line 9; for *tetrandum* read *tetrandrum.*
Page 173, line 32; *for* CANADENSIS *read* CANADENSE.
Page 204, line 36; for *C. Stevenii* read *C. alpina,* var. *Stevenii.*
Page 216, line 22; for *Seemanii* read *Seemannii.*
Page 217, line 31; for *Seemanii* read *Seemannii.*
Page 232, line 36; *for* ARVENSE *read* ARVENSIS.
Page 243, line 25; *for* TETRANDUM *read* TETRANDRUM.
Page 250, line 37; *before* var. *parviflora* insert *Phaca frigida.*
Page 273, line 25; *for* 1913 *read* 1914.
No. 487, in Contents, line 9; *for* 315 *read* 314.
Page 334, line 20; for *oblonga* read *oblongata.*
Page 377, line 9; for *Isnarda* read *Isnardia.*
Page 402, line 34; *for* ancestory *read* ancestry.
Page 417, line 5; *for* Batte *read* Bath.
Page 436, line 35; *for* to *read* too.
Page 437, line 19; *for* 51 *read* 31.
Page 447, line 15; *for* trys *read* tries.
Page 494, line 19; *for* southern *read* northern.
Plate 570, line 4 of caption; *for* Township *read* County.
Page 538, line 16; *for* 3–5 *read* 2–3.
Page 539, line 18; *for* London *read* Loudoun.

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